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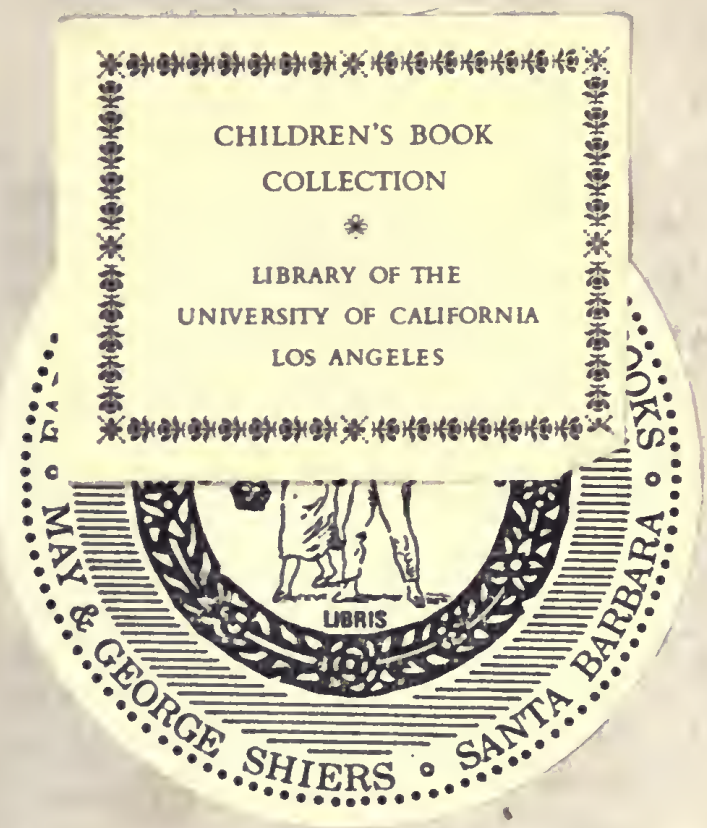

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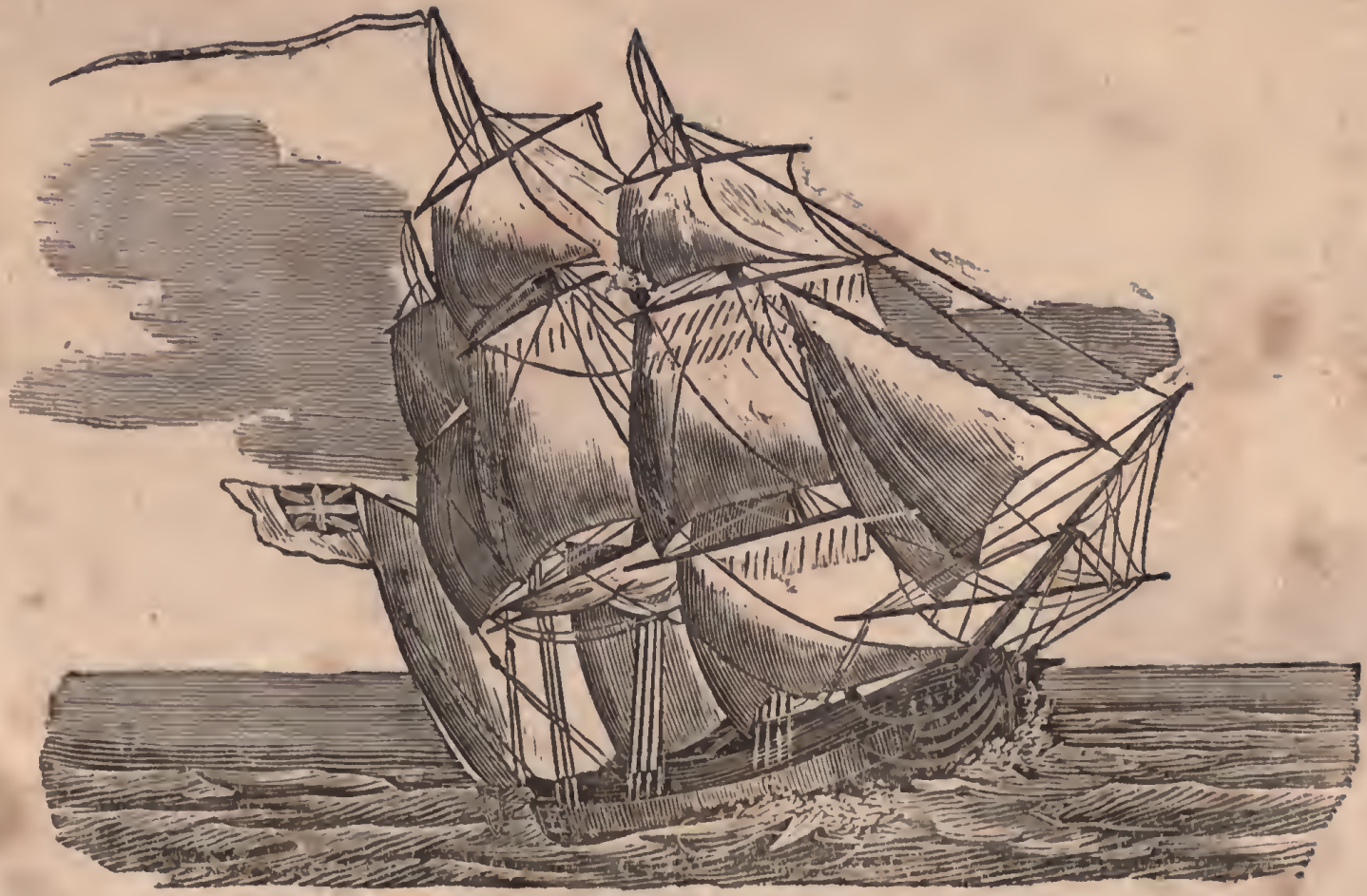

# NATURE DISPLAYED:

DESIGNED

TO EXCITE THE YOUTHFUL MIND

TO

PIETY AND VIRTUE.

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"READ NATURE; NATURE IS A FRIEND TO TRUTH."

*Young.*

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# PREFACE.

THE following Book is partly compiled from a small work, entitled "The Catechism of Nature," and translated from the Dutch.—Its object is to give the Young, for whom it is chiefly designed, an early acquaintance with the Wisdom and Goodness of the Almighty, as displayed in the works of Creation—and, to promote this laudable design, it has been enlarged to its present size, in the form of Dialogues between a Father and Son. If it tend to awaken in the youthful mind, admiration of HIS Power, without whose creative WORD was not any thing made that was made, and that reverence and gratitude towards the omnipotent and all-wise Being, excite a desire to please him, by walking in the paths of Virtue and Religion, the Editor's wishes will be answered.

# NATURE DISPLAYED.

## INTRODUCTORY DIALOGUE.

*Father.*

THE first grand object of your inquiry, my dear boy, is, God your Creator.

*Son.*

How may I acquire a knowledge of my Creator?

*Father.* From his works, and from his word.

*Son.* Has not God revealed himself to us in the Bible?

*Father.* Without doubt. But when you can see, as it were, with your own eyes, his adorable perfections, it is certainly your duty to view his works, as well as to read his word.

*Son.* Has this been the practice of wise and good men in former ages?

*Father.* Yes; Moses, Job, David, Isaiah, and others. Solomon, in particular, we find, spoke of trees, of beasts, of fowls, of creeping things, and of fishes. The Saviour himself also has directed our attention to the works of nature. "Behold the fowls of the air! consider the lilies of the field, how they grow!"

*Son.* What may I expect from contemplating the works of nature?

*Father.* Both profit and pleasure. As God has formed the eye to behold, and the mind to receive information from the beauties of nature, it must be both agreeable and useful.

*Son.* Is not this a pleasure confined to the learned?

*Father.* By no means; the peasant, as well as the philosopher, may partake of this pleasure. A moderate share of knowledge is sufficient. The creation is open to the view of all; it only requires observation,

and a wish for information. "The works of the Lord," says David, "are great, sought out of all them that have pleasure therein."

*Son.* What may I expect to find in the works of God?

*Father.* Whatever is wise, great, good, and perfect. God beheld every thing that he had made, and saw that it was good.

*Son.* And can we in all the works of God discover the marks of his power, wisdom and goodness?

*Father.* We can discern that most of them are made with exquisite art, contrived with infinite wisdom, and ordered with a wise design; that we cannot do so in all is owing to our limited capacity.

## DIALOGUE II.

### ON THE FIRMAMENT AND THE HEAVENLY BODIES.

*Son.* WHICH of the works of God should first engage my attention?

*Father.* Turn your eyes up to the firmament, that wide boundless space, in which are fixed the earth, the sun, the moon, the planets, the comets, and the stars. "The heavens," says David, "declare the glory of God, and the firmament sheweth his handywork." There is no speech nor language where their voice is not heard.

*Son.* What are the principal qualities of the firmament?

*Father.* Extent and transparency. It must be very extensive to contain the innumerable heavenly lights; and transparent, otherwise we could not see them: as for its extent, it cannot be computed; its boundaries are known to God alone; and its transparency is equally amazing.

*Son.* What stars are those which we see in a clear evening?

*Father.* They are self-shining bodies like our sun, but on account of their immense distance appear so very small.

*Son.* How many stars are there in the firmament?

*Father.* The number we see with the naked eye is not considerable; but, as the better our glasses are, the more we see: to speak in the language of men, "they are innumerable."

*Son.* Why do they twinkle?

*Father.* That appearance is occasioned by intervening vapours floating in the air; but I should mention that there are certain of the heavenly bodies which are called planets, and these do not twinkle. The word planet means that they have motion, for they move round the sun, whereas the others are called fixed stars, and are not observed to have any perceptible motion.

*Son.* The stars appear to be placed without any order.

*Father.* They appear so to our limited sight, because it cannot in one point of view take in the whole system, but we can partially trace the most exact and beautiful order in their arrangement, and knowing that they were arranged by God, we may

believe that order, and harmony pervade the whole.

*Son.* Were the stars created only for our use?

*Father.* It is unreasonable to suppose it, on account of their vast distance: they were probably created to enlighten other worlds, as the sun enlightens ours.

*Son.* Are the fixed stars then suns like ours?

*Father.* Yes, such is the prevailing opinion of astronomers.

*Son.* Are they in no degree serviceable to us?

*Father.* They serve to enlarge our ideas of the works of God, and to diminish the gloom of darkness: they are of great use also to mariners; that one particularly, which is called the north pole star and which always has one and the same position in the heavens, is a guiding light to those who live in the northern hemisphere, whilst other stars perform the same offices for those who inhabit the southern hemisphere.

*Son.* But let us speak of our own sun, if you please, sir. How large is the sun?

*Father.* Ten hundred thousand times larger than our earth.

*Son.* How far do you suppose the sun to be from the earth?

*Father.* Ninety-five million one hundred and seventy-three thousand English miles.

*Son.* What an amazing distance! Would it not be better, if the sun was nearer to us?

*Father.* Our all-wise Creator could not mistake. He has exactly adjusted its proper place: if it were nearer, we should be perhaps burnt; if farther off, we shou'd probably perish with cold, the seas would have been frozen over, and the entire globe rendered barren and uninhabitable.

*Son.* What benefit do we receive from the sun, beside its affording us light?

*Father.* By its warmth and heat it promotes vegetation, cherishes animal life, and raises the vapours from the sea, without which we should have no rain.

*Son.* Why does not the sun shine always, to give light to the same parts of the earth?

*Father.* One reason perhaps was this, to oblige man to cease from his labour, in order that he might be induced to refresh the body by sleep.

*Son.* How does the absence of the sun accomplish that?

*Father.* At sun-set, silence as well as darkness invites us to repose; the horse, the ox, and other domestic animals soon sink down in sleep, the birds disperse themselves to their respective nests—the winds are gradually hushed, and for several hours no sounds are heard to disturb the rest which man requires.

*Son.* I think I see in this the great care of Providence.

*Father.* Yes, it reminds you of the care of a tender parent, who shuts out the light, and removes all noise from the place where her infant lies—whilst she fondly watches over him, that his repose may not be interrupted.

## DIALOGUE III.

### THE SAME SUBJECT CONTINUED.

*Son.* I shall not ask you the use of light, for I perceive it every day of my life.

*Father.* It is indeed the very life and pleasure of animated nature. For what comfort would there be in this world, were we to live in perpetual darkness? How could we provide ourselves with food and necessaries? How could we go about the least business, or be of any use in the world, or derive any usefulness from others, if we had not light and those admirable organs of the body which the great Creator has adapted to the perception of this benefit? But now, by the help of light, (the first created of the Most High,) men are enabled to go here and there as their occasions call, they can transact their business by day, and refresh and recruit themselves by night with rest and sleep; they can with admiration and plea-

sure behold the glorious works of God—they can view the glories of the heavens, and see the beauties of the flowery fields, the gay attire of the feathered tribe, the exquisite formation of many quadrupeds, insects, and other creatures; they can take in the delightful prospect of divers countries and places—they can see with admiration the great Creator's wonderful art and contrivance in the parts of animals and vegetables; and in a word, behold the harmony of this lower world, and of the firmament above, and survey in all God's exquisite workmanship.

*Son.* Of what nature, or quality, is light?

*Father.* It is an emanation of rays from the sun, spreading themselves with inconceivable velocity through the ether. Light is exceedingly fine and subtile; it penetrates through glass, and is diffused over the whole world.

*Son.* I suppose light is not long in coming to us from the sun.

*Father.* Suppose that the motion of light was no swifter than the motion of the swiftest bodies on earth, such as a cannon ball, or even of sound, (which is the swiftest motion we have next to light,) in this case light would take up in its progress from the sun to us above thirty-two years, at the rate of the first, and above seventeen years at the rate of the second; whereas it is actually only seven and a half minutes coming to us, so that light flies above 200,000 miles in a second.

*Son.* Is there any thing more particular in these rays?

*Father.* They are the cause of all the different colours we see, of the morning and evening twilight, and of the light coming into our houses.

*Son.* What am I to understand by the morning or evening twilight?

*Father.* The gradual slow increase and decrease of the sun's light; without which we should pass instantly out of dark night

into clear day, and the light would as suddenly leave us.

*Son.* Would that be prejudicial?

*Father.* Such a sudden transition as the former would be dangerous to the eye; and the latter would often perplex and distress us: against both these inconveniences God has wisely provided by the twilight.

*Son.* What other cause may there be for the gradual change from light to darkness which we observe in the evening?

*Father.* The darkness of night approaches by slow steps, in order to remind man that he needs repose, and must make an end of the work in which he is engaged.

*Son.* And yet many of our occupations sometimes require to be carried on by night as well as by day.

*Father.* And therefore it is that the traveller upon land, and the helmsman who guides the course of his ship through the sea, have still the gentle light of the moon to direct them.

*Son.* And for those who have work to do within doors, God has given us the means of making an artificial light.

*Father.* Yes, we find the means of producing light in the flint, in wood, in the oil and fat of animals, in the wax which the bee collects from flowers, and in the substance called coal, which is found so abundantly in Great Britain and Ireland.

*Son.* We have often seen the sun rise, what a beautiful sight!

*Father.* There is nothing equal to the magnificence of the scene when the sun rises unclouded above the horizon—and yet how few think of enjoying it! I have sometimes thought that if the sun were to rise but once in the year, and that during the remainder of the time, the earth was to receive its light only from the moon and stars; what wonder and delight would men experience, when after so long a night they beheld it slowly and majestically emerging from the horizon, driving away the morning mists by the power of its rays, and pouring

both light and heat upon our hemisphere—I pity him who can view with coldness and insensibility such a glorious scene.

*Son.* It is indeed to be regretted that because it is a wonder daily offered to our eyes, we should feel less forcibly the power of Him who created it.

*Father.* Yes, James, its daily recurrence ought to increase our gratitude, and yet it is the very circumstance which diminishes it.

*Son.* I observe that twilight is always shortest in winter, when the nights are long and dark, and yet I should expect the very contrary, for it is in summer that man from the great length of the day wants it least.

*Father.* I believe nothing would be worse managed than the government of the world were it given into the hands of men, and you cannot have a stronger illustration of the truth than this—you know that our nights always become longer, and the darkness deeper after a man has gathered in his harvests—then the earth, no less than he who tills it, wants to take its rest; both of

them thus become refreshed, and recover the strength necessary ere long to begin their labour anew.

*Son.* Now I see that the length of the twilight is diminished only when it is less wanted.

*Father.* And mark how regularly it lengthens when the necessity of working calls for a prolongation of light, even after the sun has set. Thus man is enabled to carry on part of his work when night has moderated the heat of a summer day, and he sees distinctly what comes under his sickle.

*Son.* Thus indeed we see God's intention to be gracious, and are called upon to render him thanks and praise.

*Father.* Nor is learning necessary for this, for whilst the husbandman thus finds coolness co-operating with the light to forward his labour, he is taught to reflect on Him who ripens the harvest by the sun during the day, and sends a gentler light to assist him in cutting it down at night.

*Son.* I see then it would be not only stupid but ungrateful to behold nothing in the morning dawn but a natural appearance which goes before the day.

*Father.* It tells us, my dear boy, that the Almighty is still watching over us to give us that season which succeeds the period of sleep: it declares to us like a faithful monitor, that the hour for active labour is come. The birds are in the fields before man, they fill the air with their thousand pleasing notes, which reach his ears till he is entirely awake. The beasts of burden and the cattle wait only for his orders, and make themselves ready to move at the first signal; and now the hum of busy day comes on. The roads, fields, the city swarm with thousands of husbandmen or travellers, or tradesmen, all intent upon some object.

*Son.* But whilst some animals come forth from their resting places, are there not others which retire thither at the first appearance of the dawn.

*Father.* Yes, by the ordering of that Providence, which has given man the dominion over all other animals, the wild beasts or other noxious creatures which might molest him on his way, respectfully retire, and leave him to follow his various occupations. It is not terror, for they do so equally when no hunter is near to pursue—an irresistible and powerful hand drives them into the recesses of the forest, as if the gracious purpose were that they might not interrupt his industry, or draw away his attention from the business in which he is engaged.

## DIALOGUE IV.

### THE SAME SUBJECT CONTINUED.

*Son.* Are there not other lights in the firmament?

*Father.* Yes: but as I mentioned, they shine only with borrowed light, and are called planets.

*Son.* What are the names of those planets?

*Father.* That which is nearest to the sun, we call Mercury; the next Venus; then comes our earth, with its moon: still farther from it are Mars, Jupiter, and Saturn, with their moons, which are all enlightened by the sun.

*Son.* Has not a new planet been lately discovered?

*Father.* Yes, by that celebrated astronomer, Mr. Herschel, who called it, in honour of his royal patron, King George III. Georgium Sidus, besides which there are four smaller planets, which are however, too minute to be observed with the naked eye.

*Son.* Our earth has a moon; have the other planets moons too?

*Father.* Jupiter has four, Saturn seven, and the Georgium Sidus two, as discovered by Mr. Herschel's great telescope.

*Son.* How are those planets to be distinguished from the stars?

*Father.* The stars twinkle: the planets shine with a steady light. The planets are also continually changing their position in the heavens; but the stars keep their respective places, and are therefore called fixed stars; besides which, these latter, even with our best telescopes, seem of the same size, whereas the planets on the contrary, are seen better and appear larger in proportion to the goodness of our glasses.

*Son.* What advantage does man draw from the unchanging position of the fixed stars?

*Father.* They guide him as I have already said in his travels on land and at sea, shewing him the different points of the compass, north, south, east and west. By observing them, he can also tell though in the midst of the wide sea, where he is.

*Son.* But when the stars are hid from view by clouds, how then can the traveller or seaman find his way?

*Father.* By the fact, that iron when touched by the load-stone and balanced, is found always to turn one of its ends towards the north. Thus he knows the place where his starry guides remain, even though he cannot see them, and he shapes his course accordingly.

*Son.* I cannot understand how these immense globes hang as it were self-suspended in the air.

*Father.* The manner in which this is produced, it is above our capacity to understand. We know, however, that these bodies move along their trackless paths, according to a law which has never been once broken since the creation of the world; and our part is to wonder and adore the Power which formed and gave them motion.

*Son.* If the twinkling of the fixed stars is caused by vapours in the air, why do not the planets also twinkle, for the same vapours lie between them and the spectator?

*Father.* The fixed stars as I have said, are self-shining bodies, and the rays of bright light which proceed from them, are continually agitated by the air as they pass through. The planets on the other hand, like the moon, shine only with reflected light, the rays from which are too weak to be so affected by the atmosphere. The light from a lamp or a fire, as you know may be too strong for the eye to look at steadily, whilst we can without inconvenience, read the book or examine the objects which they illuminate.

*Son.* In what manner do the planets move?

*Father.* They all move round the sun; but not in the same orbit or path, nor in the same time.

## DIALOGUE V.

### THE SAME SUBJECT CONTINUED.

*Son.* In what time does the earth move round the sun ?

*Father.* In three hundred and sixty-five days, which makes our year: though the earth, however, revolves with incredible swiftness, we are insensible of its motion.

*Son.* Why are we insensible of its motion ?

*Father.* Because the air which encircles the earth (which we call the atmosphere) is carried along with it, and that not by sudden bounds or starts, but at a regular and equable rate; and all surrounding objects move with us at the same time.

*Son.* Why is it not always equally warm?

*Father.* The inclination of the earth's axis, as it moves round the sun, is the occasion of the various seasons; Spring, Sum-

mer, Autumn and Winter. This I shall explain to you when we speak on astronomy.

*Son.* Has the earth any other motion?

*Father.* Beside that round the sun, which we call its annual revolution, it has another motion round its own axis, once in twenty-four hours, one-half of it being thus turned towards, whilst the other is turned from the sun, which makes our day and night; this we call its diurnal or daily revolution.

*Son.* Does the moon move round the earth?

*Father.* Yes, in twenty-eight days; or more accurately in twenty-nine days, twelve hours and forty-four minutes, for that is the interval between two full moons; and continually it attends upon the earth, during its whole revolution round the sun.

*Son.* I do not understand the reason of this difference.

*Father.* In twenty-eight days the moon has arrived at the same point with respect

to the earth from which it set out: that is, it has made a perfect revolution, but in that time the earth has been itself moving on its yearly course round the sun, carrying the moon along with it—it therefore requires about one day and a half to go over the distance which shall place it again opposite to the sun, the only position in which a full moon can take place.

*Son.* Why do we not always see the moon?

*Father.* When it is on that side of the earth next the sun, that is between the earth and the sun, then the dark side of the moon is towards us, for which reason we are not able to see it.

*Son.* What am I to understand by an eclipse.

*Father.* When the moon's shadow falls upon the earth, we call that an eclipse of the sun, because the moon prevents our seeing the sun, more or less, according to the extent of its shade. And when the shadow of the earth falls upon the moon, we call

that an eclipse of the moon. Observe, an eclipse of the moon can only happen when it is full moon, and an eclipse of the sun when it is new moon.

*Son.* As the moon, you say, is a dark body of itself, how do we receive any benefit from it ?

*Father.* By its reflecting to our earth the sun's light; for in this way the moon does more to relieve the darkness of our nights than all the stars taken collectively.

*Son.* But I observe it is only at certain times we have moonlight.

*Father.* True, but you should also remember that we do not always want her aid. Whenever we have occasion for the moon, a little attention will enable us to profit by her services—thus should a man find it necessary to continue his journey after the sun has set, the first quarter of the moon guides him on his way; should he wish to set out before dawn, the last quarter tenders him its services before the morning dawn—

and the full moon may be said to afford him a day of twenty-four hours, by giving him uninterrupted light between sunset and sunrise.

*Son.* What a singular mark of the Divine Goodness thus to provide for the absence of the sun! But have we any other advantage from the moon?

*Father.* Yes, it is, together with the sun, the cause of the ebbing and flowing of the sea, which tends to purify the waters of the ocean; besides which the tides are very useful for navigation.

*Son.* Is the moon inhabited?

*Father.* Some philosophers suppose it is; and that our earth serves as a moon to those who dwell there. For you may see plainly yourself, that our earth reflects the sun's light on that side of the moon which is not illuminated: this you may perceive every new moon; but more in the winter than the summer months.

*Son.* Do you also suppose then, the planets to be inhabited?

*Father.* It is conjectured that they are, and the supposition is grounded upon reason and analogy.

*Son.* If the planets are inhabited, must not the inhabitants of those which are farther from the sun than our earth feel intense cold; and the inhabitants of those which are nearer be scorched with heat.

*Father.* The Almighty always fits his creatures for the situations in which he places them. This is enough for us to know, without puzzling ourselves with conjecture how he does it.

*Son.* But might we not expect the Bible to have given us some light upon this subject?

*Father.* The Bible was not designed to teach us astronomy, geometry, or mathematics. It gives us a minute relation of the formation of our own world—and only adds that the other parts of the universe are innumerable. Philosophical researches soar above the level of common understandings. Moral truth is of more intrinsic value—and

an humble, obedient heart worth all the stores of human learning. But we are losing sight of our object. What question did you next design to ask me?

*Son.* What idea am I to form of the comets; are they bodies of fire?

*Father.* No. They receive their light from the sun, which is apparent from their shining trains.

*Son.* Are not these trains or tails, fire?

*Father.* They are conjectured to be only their atmospheres, enlightened by the sun.

*Son.* Are not the comets supposed to pass far beyond the limits of our system?

*Father.* Yes, which serves to give us a very enlarged idea of the extent of the firmament. The period of that comet's revolution round the sun, which appeared in 1759, was computed at about seventy years. And that which was seen in 1680, has been shewn to be more than five hundred years going round the sun. The orbits of more than fifty comets have been fixed with sufficient accuracy to ascertain when they may be expected to appear again.

*Son.* Are the comets supposed to be inhabited?

*Father.* All that we can say is conjecture: if they are inhabited, the beings who live there must be very different from those we have been conversant with.

*Son.* Do these comets prognosticate evil?

*Father.* Many ignorant people have been frightened at their appearance, as if they portended some public national calamity; but without any foundation: for peace, plenty, and prosperity have followed their appearance as well as war, pestilence, or famine. "Be not dismayed," saith the Lord, by his prophet Jeremiah, "at the signs of the heavens, for the heathen," the ignorant, "are dismayed at them."

## DIALOGUE VI.

### ON THE AIR, WIND, RAIN, &c.

*Son.* I often hear of the air; what idea am I to form of an element that is invisible?

*Father.* It is a fluid, which agitates bodies when it is in motion. In a word, it has the properties of rarity, trasnsparency, and elasticity; and when compressed, has an amazing power, similar to the expansion of gunpowder.

*Jon.* Has the air any other peculiar properties?

*Father.* Without air we should have no sounds of any kind, and therefore the sense of hearing would be useless, for we could not converse with each other—we should have no smell, nor yet light except when looking at the sun, or object emitting it.

*Son.* How is it that air is necessary to the production of sound?

*Father.* Air is the medium which propagates sounds from the bodies that strike upon it, thus conveying to our ears information of what is passing sometimes at a very considerable distance from us. I am anxious, my dear boy, to give you such information as shall lead your thoughts from this world to Him who created it. By the

motion of my tongue and lips, I am able to form such articulate sounds as the general consent of our country has agreed to consider the signs of such and such ideas—but without air my lips could not utter sound, and even though they could, they could never strike upon your ear, without air to convey these sounds.

*Son.* How great the blessing of the sense of hearing, to which the air I see is necessary, I can understand from that vacant and melancholy air which deaf people exhibit.

*Father.* Their insensibility to sounds, however, is produced by a defect in the organ of hearing, and not by any inability of the air to transmit sounds;—but it deserves your admiration, what a relation the Almighty has established between sounds and the sense of hearing—the slightest sounds might have given a violent shock to the organ, and deranged it:—again if sounds and noises in order to be heard, had required to be very violent, we should not have been able to speak without the greatest efforts,

and speech, instead of being a blessing, would have become a real torment; but now, what infinite and varied pleasure does the air convey to us; the slightest whisper, the warbling of the birds, the murmuring of the brook as it flows over its pebbled channel—the lowing of the cattle—the hum of the crowded city—the charms of melody—the distant thunder;—all these strike upon the ear without affecting it with pain, nay, they produce the greatest admiration and pleasure.

*Son.* And is the air also necessary to life?

*Father.* Yes; It is the air by which the whole animal world breathes; not only the animals which inhabit the earth and air, but those of the waters also—without it few animals can live longer than a few minutes; but it is also necessary to vegetables, as well as animal life, to trees and plants, and the whole vegetable race: these inanimate parts of the creation, blooming and flourishing in a free air, and becoming pale and sickly and at length withering away, when by any means excluded from it.

*Son.* Is it useful to animals in any other way, than by supporting life?

*Father.* It is necessary also to the motion and convenience of many of them: all the winged tribes owe their flight and buoyancy to it, and even fish themselves cannot ascend and descend in their own element well without it.

*Son.* I think that the air has one property, which you have not mentioned, the very opposite of those: I hear it is the air that resists and corrodes iron, and gradually wears away those substances which are exposed to it.

*Father.* Yes, the air has the power of dissolving bodies, but observe how beneficially this operates: dead bodies, carrion, and all matters that putrefy, and would become unwholesome, are removed before they can do harm. Observe also, how wisely Providence orders all things; the air by degrees causes our houses, &c. to fall into decay, but the operation is a slow one, whereas under ground, there are inexhausti-

ble stores of useful substances, metals, earths, stones, &c. which have thus lain by till wanted, secure from corruption, because the air had no access to them.

*Son.* I understand all these uses of air except one, that it reflects light, will you explain that to me?

*Father.* You will easily understand it, by turning your back to the sun: in that position no rays come to the eye from that body, and yet the air on which these rays fall, reflecting the light on all sides, you see as perfectly as if you had your face turned to that body, from which light proceeds.

*Son.* When I see the steam proceeding from the spout of a boiling kettle, and that it soon disappears, I think it shews us another use of the air, for I remember you once told me, that the steam which is only strongly heated water, is dissolved by the air.

*Father.* You are right there, and indeed a most important office in the order of nature is thus performed, clouds are caused

by the water which the sun and air draw or suck up from the surface of the sea, collecting at different distances from the earth's surface.

*Son.* Now I understand why it is that in a moment, sometimes thick clouds appear, where before there was nothing but blue sky. But if clouds are sea-water in a state of solution, what becomes of the salt?

*Father.* That is most deserving of our admiration, for the atmosphere raises and leaves the salt behind, so that pure and fresh as river or rain water, which produces the river, is, it is collected from brine.

## DIALOGUE VII.

### ON WIND, RAIN, &c.

*Son.* What is the wind?

*Father.* The wind is nothing more than a part of the air, put into motion less or more.

*Son.* From what cause does this arise?

*Father.* Principally from warmth or cold which is excited in the air. Heat expands the air, and cold condenses it.

*Son.* Have you any particular names, by which to distinguish the winds?

*Father.* Yes; according to the quarters from which they blow; East, West, North, and South.

*Son.* Will you please to tell me how to find these quarters?

*Father.* If at noon you stand with your back to the sun, the east is on your right hand, the west on your left, the north directly before you, and behind you the south; or at night, if you stand with your face to the pole star,—the east is still on your right hand, the west on your left, and north and south as just now mentioned.

*Son.* Of what use are the winds?

*Father.* The benefits arising from the winds are almost innumerable: they purify

the air, modify the heat, dry wet lands and damp houses, chase away the fogs and hazy weather, and bring us the rain in due season; also frost and snow, and milder weather. They are particularly serviceable for navigation and commerce, wafting ships upon the surface of the sea, from one part of the world to another.

*Son.* What are vapours, or clouds?

*Father.* Vapours are either thin, invisible, moist particles which float in the air; or, which being more condensed, and by that means rendered visible, are called fogs or clouds. This work of the Creator was observed of old. "He bindeth up the waters in his thick clouds, and the cloud is not rent under them."

*Son.* Of what use are these vapours hanging in the air?

*Father.* They cool the air, when it is too hot; afford us agreeable shades when formed into clouds; prevent the earth from becoming too dry; and water it with refreshing rain.

*Son.* What is the natural cause of rain?

*Father.* When the air is so full of heavy vapours that it can no longer sustain them, then these small moist particles, adhering together, fall down in fine drops, which we call rain; which heat, cold, and wind, contribute to produce; and the rain falling in drops, is a farther manifestation of divine wisdom; for if it fell in strong streams, it would injure the earth, by washing away its fine light mould from the roots and seeds; from which we should suffer great inconvenience.

*Son.* What brings the rain?

*Father.* The winds, which convey the clouds over the whole earth.

*Son.* What benefit do we derive from the rain?

*Father.* It makes the earth fruitful, it refreshes the withering plants, it cools the air in summer, it supplies our springs and fountains, and forms our rivers, so that we are never in want of water.

*Son.* What a constant round the element of water is travelling.

*Father.* Yes, you can trace it from the sea into those vapours which form the clouds; these clouds fall down in showers, which penetrate into the crevices of the hills, and supply springs, which springs flow in little streams into the valleys, and then uniting become rivers, which in return feed the ocean.

*Son.* And all the time the water is offering itself to the wants of the habitable globe?

*Father.* Yes, fertilizing the earth, causing the growth of plants, and supplying a healthful beverage to mankind and all other animals.

*Son.* Are there any signs or tokens of approaching rain?

*Father.* Many; we can foresee its approach by the wind, by birds, plants, &c.

*Son.* How comes the cold or frost?

*Father.* Generally by the wind which blows from the Continent; and the stronger the wind, the severer the frost.

*Son.* How is the ice formed?

*Father.* By an extraordinary degree of cold, which congeals the water into a firm substance.

*Son.* Of what use is frost?

*Father.* Frost is of great use; it clears the atmosphere, it braces and strengthens the human frame, mellows the clay ground, and fertilizes it, destroys hurtful insects, and serves many other useful purposes.

*Son.* What is snow, and of what use?

*Father.* It is nothing but water in another form; white and light, and falls in the most beautiful figures; which every person may see, who will but view the flakes of snow attentively. As to its use: it preserves the corn from being chilled by the frost; therefore, said David, that pious contemplator of nature: "He giveth snow like wool;" it hinders the frost from penetrating too deep into the earth. Snow is also a manure to the earth, from the nitrous particles it contains; and, by its colour, diminishes the darkness of our long winter nights.

*Son.* What is hail?

*Father.* Nothing more than drops of rain congealed by greater degrees of cold.

*Son.* Are not mists and dews wholly useless?

*Father.* By no means; they refresh and invigorate weak and withering plants, in time of scarcity of rain.

*Son.* How do they arise?

*Father.* They are vapours arising from the earth, condensed by colder air, and thus become visible.

*Son.* What is hoar frost?

*Father.* It is, like hail, only vapours congealed, and wisely ordained for the preservation of trees and herbs. The hoar frost is scattered like ashes. This also, as well as the snow, falls in very beautiful forms, which are well worth minute inspection.

*Son.* What idea am I to form of thunder and lightning?

*Father.* Lightning is occasioned by the electric matter in the clouds, which encountering each other in the air, it explodes instantaneously like gunpowder, accompanied with that awful roll, or sound, which we call thunder.

*Son.* Is thunder indeed nothing more than

sound; then I need not be afraid of what we call thunder-bolts?

*Father.* That is only a vulgar mistaken idea. All the danger arises from lightning, to which the name of thunder-bolt is some times given—and even that is not dangerous when at a distance.

*Son.* How am I to judge of its distance?

*Father.* By the interval between the flash and the thunder-clap. If that interval is considerable, it is distant, and then not dangerous—but when the clap instantly succeeds the flash, it is then near, and consequently the danger is greater.

*Son.* Have you not told me it is dangerous to go under trees when it lightens?

*Father.* Yes, because trees very much attract the lightning. It is better to continue in the open field or public road (if no house be near) than to take shelter under trees.

*Son.* Is lightning of any use?

*Father.* More so than any are aware of. It consumes noxious vapours—it promotes circulation of the air—it brings on rain at a time when

it is often most wanted, and cools the heat of summer. "Fire and hail, snow and vapour, fulfil His word."

*Son.* I thank you: I shall not be afraid of the lightning, as I used to be: but what occasions the beautiful rainbow?

*Father.* The rainbow with its beautiful colours is occasioned by the rays of the sun shining upon the falling drops of rain.

## DIALOUGE VIII.

### ON THE EARTH.

*Son.* For what purpose was the earth created?

*Father.* To be inhabited, and millions of living creatures are in every part of it.

*Son.* I have often wished to know how the earth is supported in its place.

*Father.* It stands not upon any thing—if it did, how could it move? Hear the poetical language of Job: "He hangeth the earth upon nothing."

*Son.* Does this globe then, which we inhabit, continually hang and move in the air?

*Father.* Certainly it does, as well as the other planets.

*Son.* What an amazing power must it be which fixed them, which first set them in motion, and which still keeps them there?

*Father.* God made the earth by his power—he established the world by his wisdom—and

stretched out the heavens. "On what," saith the earth's Creator "are the foundations thereof fastened? or who laid the corner stone thereof, when the morning stars sang together, and all the sons of God shouted for joy?"

*Son.* Of what are these material things chiefly composed?

*Father.* Of earth, air, fire, and water.

*Son.* What does the earth consist of?

*Father.* It consists of fine mould, stone, clay, sand, minerals, metals, fossils, &c.—which have each their respective well-known uses. But they are, most of them, hid from our sight, by the green plants and herbs.

*Son.* Why is the firmament blue—and the produce of the earth green?

*Father.* Because those two soft, pleasing colours, are agreeable to the eye, and neither weary nor injure the sight, as some other colours do.

*Son.* I think this is a complete demonstration of our being the objects of our Creator's love.

*Father.* Yes; he might have made the sky black, and fitted our sight to that colour, but then think what a sad hue it would have thrown

over every thing. Had it been red or white, we know it would have hurt the eye: but the carpet which he has spread under our feet is green, whilst the vaulted canopy over our heads is azure, a colour which harmonizes with the former, and heightens the beauty of the sun and stars.

*Son.* How many sorts of metals are there?

*Father.* The different kinds are numerous; the most useful are gold, silver, copper, tin, lead, and iron.

*Son.* Why are all these under the surface of the earth?

*Father.* If they were above, or upon the surface, they would occupy the best part of the earth, and prevent our cultivating it. As they now lie in subterraneous magazines, they are no hindrance to agriculture.

*Son.* Do these different metals lie deep below the surface of the earth.

*Father.* If they did they would be inaccessible by man; they lie on the contrary at such a distance below the surface, that the coat of earth

above shall have a sufficient depth of soil to produce food for the use of man.

*Son.* Which is the most useful of these metals ?

*Father.* Iron.—Gold may purchase iron, but it will not serve as a substitute for it, because it is not equally hard. In a word, not one thing you have about you is made without the assistance of iron.

*Son.* Will you mention a few of the uses to which Iron is applied?

*Father.* Iron unites together the materials which compose our houses. Nay, our very property would not be safe but for the custody of iron. To it we owe the chief of those instruments which are used in navigation, agriculture and all the arts, liberal and mechanic. Gold would not serve for our steam engines, nor for our ploughs and anchors; besides which all the other metals would be in a measure useless to us if we had not iron to work, and fit them for our occasions; and to sum up all, so much are we beholden to this metal, that without it, our very meat and drink could not be conveniently

dressed and prepared, nor the furniture of our houses, nor our domestic utensils be in any tolerable degree serviceable.

*Son.* Now I understand why the inhabitants of the new world, when it was first discovered, used to give pretty large quantities of gold in exchange for nails and iron tools.

*Father.* Iron in fact was of more real service and benefit to them than their gold could possibly be.

*Son.* What other valuable things are to be found in the earth's grand magazine?

*Father.* That valuable fuel for fire, coals, without which we could neither dress our victuals, nor comfortably pass our winter evenings, and which mechanics also find so very useful.

*Son.* When such a vast quantity of this fuel is consumed every day, how great must be the store, which our kind Creator has made for our use!

*Father.* Inconceivable!—consuming every hour, night as well as day, and yet these treasures not exhausted!

*Son.* Is coal equally plentiful in all countries?

*Father.* No. If every country produced exactly the same things, there would be no commerce, no intercourse, between distant nations.

*Son.* Are there any other valuable things to be found in the earth's store-house?

*Father.* Quicksilver, chalk, brimstone, limestone, salt, clay for bricks, pipes, and what is usually called earthen ware.—Marble, stone, chrystals, diamonds, and magnets or loadstones, which are so peculiarly serviceable to navigation.

*Son.* What a rich treasure the earth contains below its surface—and all for the use of man!

*Father.* Rich indeed! How thankful ought we to be to our bountiful Creator, who has provided so many good things, and in such great variety, for our use and pleasure! You may now see that man can neither lift his eyes to heaven, nor take a step upon the ground, nor dig under his feet, without meeting treasures designedly placed there for his use; and thus every thing within the circuit of creation,

convinces him how much he is the object of the goodness and tender regard of his beneficent Creator: who not only foresaw, but has made provision for all his wants; and has spared no means that might either excite his industry, or engage his affection.

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## DIALOGUE IX.

### ON MAN.

*Son.* WHICH am I to consider as the noblest work of God?

*Father.* Intelligent beings, such as angels and men. I shall now speak only of the latter. For God made him the lord of this lower world—and put all things under his feet. Gen. i. 26, "And God said, Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth."

*Son.* And his form also is, I believe, wonderfully adapted for the sovereignty with which he is invested.

*Father.* Yes, whether we regard him with respect to his body or his mind, we must say that he is the noblest work of God.

*Son.* Begin then with his mind, if you please.

*Father* Think of the reach and compass of his understanding when it is properly cultivated and exercised—the quickness of his thought, the subtlety of his invention, the commanding power of his wisdom, the depth of his memory, and, in a word, the hopes and fears which he feels with respect to an eternal futurity—God taught man more than the beasts of the earth, and made him wiser than the fowls of heaven.

*Son.* And does he not excel in outward form, as well as in inward qualities?

*Father.* Yes, it is in his outward form that we discover how well adapted he is to his condition on the earth. Had his size and proportions been less than they are, he could neither have consumed the productions of his lands, nor

would he have had strength to cultivate them. Had his stature been gigantic, he would have found himself in the midst of scarcity, and the earth would not have supplied his wants.

*Son.* And yet man, though you say he is the sovereign of creation—is neither so fleet as the horse, nor so strong as the ox, neither has he by nature those weapons of defence which are necessary for his safety.

*Father.* What need has man of greater fleetness of foot when he can have the horse for his service—and by the agency of the winds, transport himself to every part of the globe. Why should he wish for broader shoulders to be enabled to carry heavier burdens, when the ox, the camel, and the elephant are his servants— he wants not claws like the lion, nor tusks like the wild boar; if he needs defence, he can call in other animals to his aid; he can oppose his enemies with ramparts of wood and stone; he can make use of the substances which are offered to him in abundance to screen him from injuries.

*Son.* Will you be so kind as to give me some information concerning the human body?

*Father.* The most striking part of the human body is the face; and here you will remark a peculiar proof of Divine Wisdom, in this, that every human countenance is easily distinguished from another.

*Son.* I have often observed it, but do not at once see the advantage resulting from it.

*Father.* But for this there would be no security to our persons, no certainty nor enjoyment of our property; the good would often be mistaken for the bad—the innocent would often suffer for the guilty—there would be no means of distinguishing between friends and foes, between father and child; all would be confusion: as Providence, however, has now arranged it, no two human countenances are alike.

*Son.* Is there any way of guarding against this confusion in the dark?

*Father.* Yes; in the dark the sound of the voice, which is almost as various as the human countenance, prevents the confusion, and when absent the hand-writing is the witness—

a manifest, as well as admirable, indication of the Divine superintendance and management.

*Son.* This I never attended to before. Pray why is the head formed of a harder substance than the rest of the body?

*Father.* That so tender a part as the brain (the seat of reason) may be securely preserved.

*Son.* What have you to tell me of the eye?

*Father.* It is one of the most artfully constructed parts of the human body. Leaving the internal construction of the eye to the anatomist, I shall now only make the following remarks:—That the eye is moveable in its socket, that we may be able to see on every side without moving the head; whilst at the same time it is stationed like a sentinel in a watch tower to enable it to perceive objects at a greater distance:—That by its position it is well secured from injury:—That when we have too much light, it has power to contract the apple, or pupil of the eye, to ward off its too numerous rays. And again, when there is but little light, then it can enlarge it to receive more rays.

*Son*, Of what service are the eye-lashes?

*Father*. To moderate the strong light, and to preserve the eye from flying insects.

*Son*. Of what particular service is the eye-lid.

*Father*. The eye-lid is as a curtain, to be drawn up by day, and to be let down at night when we sleep, that we may enjoy our rest with greater security.

*Son*. Does it not also wipe the surface of the eye, and keep it clean?

*Father*. It does, and admirably well adapted it is to the purposes for which it was made.—It consists of a thin and flexible strong skin, the better to wipe clean and guard the cornea. The edges are fortified with a soft cartilage or gristle, by which means they close and shut the better—out of these cartilages grows a palisade of stiff hairs, of great use to warn the eye of the approach of danger, to keep off motes, and to shut out too great a light, which would be injurious to the sight. It is remarkable also, that these hairs grow but to a certain commodious length, need no cutting, and never cross

each other, as other hairs of the body do—and also, that their points stand out of the way; in the upper lid bending upwards, and downwards in the lower lid, whereby they are well adapted to their use.

*Son.* What is the benefit of the eye-brow?

*Father.* It is wisely formed to keep off the dust and sweat, which would give the eye exquisite pain, beside being detrimental to the sight.

*Son.* I observe that the eyes are differently seated in different animals.

*Father.* In birds, the eyes are so seated as to take in all objects before, behind, and at the side. In hares, the eyes are very protuberant, and are placed so much towards the sides of the head, that they can see almost upon all sides: whereas in dogs, that pursue them, the eyes are set forwards, that they may keep their prey more easily in view.

*Son.* Are the eyes of all animals moveable?

*Father.* No; for instance, those of the spider and some other insects, which frequently have four, six, or eight immoveable eyes situ-

ated in the forepart of the head. The advantage of this arrangement to the spider is, that it can watch its prey without moving its head or eyes, the slightest motion of which would scare the insects from its toils.

*Son.* In the garden-snail, I think I have remarked that the eyes are differently placed from any you have yet mentioned.

*Father.* In the snail, generally, the eyes, which are four in number, are placed at the ends of the horns, which being moveable in every direction, give information of all that is passing without.

*Son.* Will you explain to me what kind of eyes the mole has: they must be wisely set in, and guarded from danger.

*Father.* As the mole's labour is wholly under ground, it was necessary to guard this delicate organ from external injury, hence they are all deep in the head—and as the smallest light would suffice for a little workman always labouring in a dark place, the eye is remarkably small.

*Son.* The mechanism of the eye is, I suppose, very perfect.

*Father.* So perfect, that it alone is sufficient to exalt our ideas of the great Creator's wisdom. To give you a description of it would require a knowledge of anatomy on your part, but this much I may mention to you:—for a long time astronomers complained of a great defect in their telescopes, the glasses, from some fault in their substance, giving a false colour to the object which was seen through them. After a number of unsuccessful experiments, however, and much labour, it was discovered, that by joining close together three different kinds of glasses, objects could be seen free from this defect; the discovery was justly praised as wonderful, but how greatly does it raise our admiration of the Creator's works to know, that an invention, which was made by slow and painful labour, and after a long and patient investigation, is exemplified in the mechanism of the human eye—which consists of three transparent humours, permitting the object to be seen in its natural colour.

I may also mention to you, that it is found useful to blacken the sides of a telescope, in order that the rays of light coming from the object may not be dispered in their passage to the eye—but here again, the wisdom of the Creator might have been our guide, for on examining the eye we find, that the only parts of of it which are not blackened are the pupil, by which the rays enter, and the retina, on which they fall—and that on this latter, painted with the most excelling beauty, the glories of the heavens and earth are pictured.

*Son.* Do the rays of light from the object enter through the whole outer part and surface of the eye-ball ?

*Father.* No, they enter only through the pupil ; which is, as it were, a slit or orifice, which being capable of expansion and contraction, shuts out too much, or else admits sufficient light It deserves, however, especial remark, that the pupil in different animals varies in form. In some animals it is round, that being the most proper figure for the position of our eyes, and the use we make of them both by day and

night. In cats, the pupil is erect, and the eye-lids being transverse thereto, they can so close their pupil, as to admit, as it were, only one ray of light. By throwing all open, they can take in even the faintest rays, and thus distinguish objects when it is nearly dark: an incomparable provision for animals that have occasion to watch and waylay their prey both by day and night.

*Son.* The eye is indeed a wonderful organ; but how is it guarded against external injury?

*Father.* Here also we discover the wisdom of the Almighty Artist. The hollow in which the eye is set is fortified and formed with strong compact bones, lodged in a strong well-made socket—and the eye itself is guarded with a nice well-made cover.—In the eel, which has to work its way through sand and gravel, there is placed before the eye a transparent horny case or covering, which, without obstructing the sight defends the organ. The eye, says an intelligent Author, (speaking of that organ in man) is the contrivance, the work of no less a Being than the infinitely wise, potent, and in-

dulgent Creator. Without it, the animal world would be in perpetual darkness. It would labour under perpetual inconvenience, be exposed to perpetual harm, and suffer perpetual wants and distresses. By its aid we are able to see and choose the food that is wholesome, and a commodious place of habitation and retreat. We can dispatch our affairs with alacrity and pleasure. We can go where our occasions call us; ransack the whole globe; descend to the bottom of the deep; travel to the farthest region of the world. We can look about us, discern and shun the precipices and dangers which every where would enclose, and would destroy us.—And those glorious objects which fill the heavens and the earth—those admirable works of God which every where surround us, and would be as nothing to us without being seen—present their glories to us, through the medium of this noble organ, and fill us with admiration and pleasure.

## DIALOGUE X.

### ON THE EAR.

*Son.* Is not the ear also curiously formed?

*Father.* It is, indeed, a most curious organ, whether we consider its situation or its structure.

*Son.* Why is it in all animals double?

*Father.* For the same reason that the eye is double, not only for the convenience of drawing in sounds coming in different directions, but as a wise provision, should loss or injury of one of the ears be sustained.

*Son.* Is there also a wise design in its position?

*Father.* Yes, it is situated in the loftiest part of the body; where, in conjunction with its sister sense, the sight, it can receive—and near the brain, to which it communicates the quickest information;—where it can be best guarded from annoyance; and where it gives the least harm or disturbance to the other parts.

*Son.* Its outward appearance seems to be different in different animals.

*Father.* It is so; and yet in all it is admirably adjusted to the peculiar occasions of each. In man, it is of a form proper for the erect posture of his body. In birds, it is of a form proper for flight, not protuberant, because that would obstruct their progress, but close and covered, to afford an easier passage through the air. In quadrupeds it is various, according to their various occasions: in some, large, erect, and open, to hear the least approaches of dangers; in others, covered, to keep out noxious bodies. In animals which have to mine and dig for their food and habitation, the ears are short, lodged deep, and backward in the head.

*Son.* When I raise my hand to my ear, the first thing that strikes me is, that the substance is neither bone nor flesh, but gristly—pray, why is this?

*Father.* If it had been bone, it would have been troublesome, and might, by many accidents, have been broken off. If flesh, it would have been subject to contusions, besides being

unfit to receive and send the sound to the brain. When by any accident the shape of the outward ear is injured, it is always found to produce a great confusion in the hearing.

*Son.* Is there any advantage in its being so curiously and artificially turned?

*Father.* Yes, it is thus that sounds are gently sent on, so as to increase their effect; and, at the same time, to prevent their rushing on too violently, and injuring the more tender parts within.

*Son.* What is the use of the ear-wax?

*Father.* The ear-wax, which is extremely nauseous and bitter, is placed at the entrance of the organ, as it were to guard it against the entrance of those noxious insects, or other small animals, which are apt to make their retreat into every little hole.

*Son.* What is the drum of the ear?

*Father.* That on which the sounds strike, after being forwarded along the winding and arched passage of which we have spoken.

*Son.* Is there any thing remarkable in the

structure of the ear inside the drum or tympanum?

*Father.* Yes; from the tympanum the sound is conveyed along three minute bones, called from their shape, the mallet or hammer, the incus or anvil, and the stapes or stirrup, all linked together by muscles; the last-mentioned bone, being also connected with the nerves which convey the sound on to the brain—the branches of one of those two nerves being spread partly to the muscles of the ear, partly to the eye, partly to the tongue and organ of speech, and partly communicating with the heart and breast, thus establishing an useful consent between them.

*Son.* I don't clearly understand the use of this connection.

*Father.* The sight and hearing, you know, are the sentinels which are on the watch to tell us not only whether danger is approaching, but to give us information respecting what is passing without. Observe any animal when hearing any strange or unexpected noise; the ears are erected, to catch the sound—the eyes

are open, to stand upon the watch—and the mouth is also ready to call out, or utter whatever the occasion may dictate. Accordingly, it is usual with almost all animals, when surprised or terrified by any noise, presently to shriek or cry out.

*Son.* This is indeed wonderful.

*Father.* Who then but an infinitely wise and Omnipotent Being could thus have enabled animals to express their sense and meaning to others, to make known their fears, their wants, their pains and sorrows, in melancholy tones; their joys and pleasures in more lively notes; to send their minds, as it were, to great distances, or to express their thoughts near at hand.

*Son.* What is the cause of our being able to understand one another instantaneously?

*Father.* That we may have an immediate perception of each other's words, God has given to sound a swiftness twice as great as that of a ball that issues from the mouth of a cannon.

*Son.* Is there a great variety in external sounds?

*Father.* The variety is almost infinite: each bird has a peculiar song—each throat a peculiar voice—even sheep, which seem to give precisely the same sounds, have such distinct bleats, that their lambs know them amongst a thousand.

*Son.* Who can reflect on these things, and not give the great Creator his due praise?

*Son.* Astonishing indeed!—But you have not mentioned the sense of smelling.

*Father.* Our wise Creator has placed this sense in a part projecting above the mouth, that we may perceive what is pure and good by its own fragrance; and discover what is not sound and wholesome before it enters the mouth, which is, as it were, the door of the stomach. The nostrils, wisely adapted to this end, are rather broad below to receive the smell.—Through these also pass the sharp humours of the head; and when, during the time of our eating, we cannot breathe with the mouth, we can breathe through the nostrils.

*Son.* Is the sense of smelling as necessary to animals as the sight or hearing?

*Father.* Perhaps not in man, whose wants would be all supplied by others, and who knows by experience what is good or hurtful, though he had not this sense—but in the rest of the animal creation it is, if possible, more necessary: for by it they find out their food, some at great distances, some nearer at hand—some picking and choosing the kind which is wholesome, and refusing such as would be injurious; sometimes discovering it in the midst of mud and dirt; sometimes under the ground, when the sight is of no use to them.

*Son.* Is the organ of smell very curiously constructed?

*Father.* The nostrils, as I have mentioned, are the outward part of the organ of smelling, concerning which I may remark, that they are always open, in order to give an easy and free passage to the odours, by which animals are to judge whether the bodies from which they proceed are injurious or beneficial: added to which, there is a very wise provision made in

the laminæ, or plates of bone, with which the upper part of the nose is barricaded, which serves two excellent uses: to fence out any noxious substances from entering the passages whilst we sleep, or when we cannot be aware; and also to conduct the nerves of smell which are here thickly spread, and which, by their means, meet the smells entering with the breath and striking upon them.

*Son.* You have said, that without air we should have no smell; will you explain that to me?

*Father.* As the air conveys sounds to the ear, so does it transmit odours to the organ of smelling, informing us of the good or bad qualities of the food which is before us, acquainting us with what is good and wholesome, by those agreeable sensations which it produces; or else, in the same way, giving us timely notice to beware of every thing that is poisonous, infectious, or unwholesome, whether in our meat, in the air, or in our habitations. It may also be observed concerning it, that, together with the sight and taste, its neighbouring

senses, it sits as it were in judgment upon the aliments which are about to be received into the body, and exercises a far nicer discrimination than either of the other two.

*Son.* How very much the taste contributes to our enjoyment.

*Father.* Yes, the goodness of an all-wise Creator is in nothing more apparent than in His annexing pleasure to the reception of the food which is necessary to the health of the body. But for this we should perhaps neglect to satisfy our appetite at the proper times. Providence, however, has varied the pleasures of the taste, by diversifying the flavor of the different kinds of food which give nourishment to man.

*Son.* Do not the pleasures of taste, however, often lead to gluttony and excess?

*Father.* There are none of the good gifts of God that may not be abused, and this among the number. It is our duty to acknowledge His wise design in making the nourishment of the frame a pleasure not a task—at the same time warning you, that it is perverting the good

gifts of Providence, and is highly sinful, to exceed the limits of temperance and moderation.

*Son.* Have you any remark to make on the sense of feeling?

*Father.* The sense of feeling is spread over the whole body, whereas the other senses have their residence in the head.

*Son.* We may therefore suppose that it is the sense most essential to our well-being, since it is so largely diffused.

*Father.* It is, indeed, that sense most necessary to our safety.

*Son.* What is the principal organ of the touch?

*Father.* The hand: and here I must direct your attention to the wonderful art which Providence has displayed in its construction.—Observe the fingers, how they bend, by means of the joints, in such a way as to be able to lay hold of round, cornered, cylindrical, and all other forms of bodies. The unequal length of the fingers was necessary to enable us to grasp round bodies. With respect to the se-

paration of the thumb, it is not necessary to point out its importance, or the numerous advantages which result from it. But it will be better for me here to quote what a very lively and entertaining Author says of the hand and arm.—"Behold the animals! one is born a hunter, and has the instruments fitted for hunting: another is born a fisher, and it is in order that he may reach very deep into the water, that he has both his neck and beak very long, and has a pair of long, scaly, unfledged thighs, that he may wade into the water without soiling himself in the mud. The vocation of another is to carry or to draw burdens, to which purpose his hams and shoulders are wonderfully adapted—but no more is to be expected from them. You may, perhaps, with blows, incitements, or exercise, break them to some less common operation, and oblige them to vary their motions, upon given signals, so that a careless observer may suppose them endowed with reason; but all that skill resides in yourself, and argues no particular dexterity in them, nor the least degree of perfection acquired by reasoning.

But man, who is endowed with reason to direct him, has a body capable of performing the greatest variety of operations.

His arm, by stiffening, performs the functions of a lever or a bar. When bent in the several joints that divide it, it imitates the flail, the bow, and any kind of spring whatever. By doubling the fist that terminates it, it strikes like a mallet. When it rounds the cavity of the hand, it holds liquids like a cup, and transports them as a spoon would do. By bending or joining its fingers together, it makes hooks, pincers, and nippers of them. The two arms stretched out imitate the balance, and when one of them is shortened to support some great burden, the other, stretched out immediately on the opposite side, constitutes an equilibrium; and, like the Roman balance, makes up the overplus of the weight with the length of the lever. But comparing that arm and hand with our ordinary instruments, is extenuating their merit. In the exactest truth, the arm is the model of all instruments whatsoever, since they are all so

many imitations or extensions of its different properties. That arm, which by stiffening heaves up a stone or a piece of timber, has given us the idea of the lever; it lengthens itself, in a manner, by laying hold of that lever; by which means its strength may be increased an hundred times or more, and man enabled to move, with facility, whole rocks and trees.

The hand of man may also carry and transport fire or liquors, stir up the earth, lay hold of wood, stones, or any other body; but it performs all these actions only in a small degree, often with some disadvantage, and at the risk of being burned or bruised. A sense of the services it offers him, and of the dangers he exposes it to, raised in him the idea of helps—spoons, nippers, pincers, shovels, spades, pitchforks, and all tools in general, are so many hands which imitate the power of the human hand—it screens itself from being hurt by offering them in its stead; and what its natural weakness hinders it from executing by itself, it performs with advantage by the shape and solidity of the tools it is capable of managing.

That arm, which is not two cubits long, and but four or five inches broad, performs wonders when assisted by the vigour of the tools which represent or defend it: it seems then that nothing can resist or stop it—it bruises vast rocks, and breaks through mountains—it restrains rivers, and forces them to run in new channels—iron, and all metals, take whatever form it is pleased to give them—it conquers the resistance of marble and stones; it shapes them at pleasure, like a piece of soft wax; and now makes of them an arch, to join the two sides of a large canal; now whirls them about into a staircase, to render every part of man's abode accessible to him; or lays them along, side by side, to form a durable causeway. Its dexterity, in short, turns every thing to its profit; yet that hand is of itself very small—it has produced nothing it makes use of: but when we cast our eyes upon its victories and its productions, we lift our hearts to Him who made it, and ascribe all its powers to the great Creator of all things.

*Son.* Where are the senses the strongest?

*Father.* Where they are most wanted. For instance—the taste on the tip of the tongue, and the lips; the feeling at the ends of the fingers, and in some other parts. Our senses are set, as I have said, as faithful guardians for our preservation; and when we lose one sense, we often find that another grows the stronger—as in blind people, it is observed that the hearing becomes more acute.

*Son.* What merits our farther attention in the head?

*Father.* The tongue, that wonderful instrument of speech, from which arises so great a part of our earthly happiness. It is also well adapted to assist the chewing of our food; to mix it with the saliva, so necessary for digestion; and to help it in the passage to the throat: and, without the tongue, we could have no vocal music.

*Son.* The use of the teeth I need not ask you, but I should like to know whether all animals have the same kind of teeth as man?

*Father.* The teeth in different animals are variously shaped, but in all they are fitted to

their food: in those which live on flesh, they are sharp-edged or pointed, for catching, holding, and tearing their prey: in those which feed on grass and vegetables, they are adapted for gathering and bruising.

*Son.* But birds have no teeth; how can they divide their food?

*Father.* The bile performs the first process, the craw and gizzard carry it on, assisted by small stones, or gravel, which they swallow, and which serve to bruise it, fit for digestion. But in insects the provision is most curious.

*Son.* Let me hear it, for the subject is most interesting.

*Father.* In caterpillars, for example, you will observe teeth, with which they bite and devour the tender vegetables on which they live; but in their mature state, that is, when the caterpillar becomes a butterfly, it has no teeth, but a proboscis or trunk, for sucking up the honey out of the cups of flowers.

*Son.* This is indeed wonderful.

*Father.* The trunk would be no use to them when they could only creep, and must therefore

feed on leaves; but when they have wings for flying, then the teeth, which are no longer necessary, give place to an instrument more fitted for gathering the food on which they live.

*Son.* How is it that infants have no teeth?

*Father.* They have no teeth so long as they are unable to use them. When at the breast, teeth would only hurt themselves or the nurse's nipple: but when the frame requires stronger support, and more nourishing food than breast-milk, then they are furnished with teeth: and again, when old age has weakened the strength and taken away the powers of digestion, as the strong food which was used in the prime of manhood would be no longer fit, it is a beautiful provision, that the teeth grow loose and fall out; thus making it necessary for old persons to take the soft food, which is better suited to their weakened powers of digestion.

*Son.* When the teeth have chewed, I suppose the food is then fit to pass into the stomach?

*Father.* It is; but here you must remark, that the mouth and throat are furnished with a number of glands, which, during the mastication

of the food, pour out a quantity of saliva (or spittle), which moistens and smooths the passage of the throat, and mixing itself with the food, assists it in its descent into the stomach.

*Son.* What prevents the teeth, in man, from wearing away by such incessant labour?

*Father.* A fine enamel, with which they are covered. For when this wears off, the teeth decay, and hence arises the common complaint, the tooth-ache. But, beside their use in chewing, you may not perhaps have observed that they contribute to the formation of our speech: for they who lose many of their teeth are not so easily understood. The lips also serve for the same purpose—hence some of our letters are called labials. Beside this, with the lips we receive and taste our food.

*Son.* Is the passage of the throat very large in all animals?

*Father.* Nothing is more variable in size than the gullet, or œsophagus. In the fox and dog it is large, because those animals feed on bones, and often swallow them whole, or with little chewing. In sheep, rabbits, or oxen, it

is smaller in proportion, because they bite short, and swallow less at once: while in a certain kind of whale, which feeds on a kind of sea insect, or on a very small kind of fish, it is not two inches in diameter, though the animal itself is more than twenty feet long.

*Son.* The passage or gullet must be very long, if we judge by the neck—is that length of passage necessary?

*Father.* The length of the neck, in man, is rather for the purpose of allowing him to turn the head round, without moving the whole body. It is provided with stiff bones, which are in fact the continuation of the spine or back-bone, and like it composed of several joints, each of which turns freely upon the others, like a ball and socket.—But suppose we here pause a little, lest I weary your young mind.

## DIALOGUE XI.

### ON THE HUMAN BODY.

*Father.* We now proceed to the throat.—In this is an open tube, which we call the wind-pipe, through which we breathe. Behind this is another, called the gullet, through which the food passes into the stomach.

*Son.* Must not then our food pass over the open wind pipe, and consequently be in danger of falling in?

*Father.* So you might well think: but provision has been made against this. Behind the root of the tongue we find a muscular membrane,* which closes the wind-pipe whenever we attempt to swallow any thing, over which the food passes, as if it went across a bridge.

*Son.* A crumb of bread gives us pain in the throat sometimes; from whence does that arise?

*Father.* From its falling into the wind-pipe (or, as we commonly say, going the wrong

* Called the epiglottis.

way); but this does not happen often, unless we laugh or talk while we have our mouth full of food.

Great wisdom is also discernible in the structure of the neck. It is formed with so many joints, that we can easily turn the head without moving the whole body; and is provided with stiff bones to keep the head upright, without which man would lose much of his grace and dignity.

We now descend from the head and neck to the body. The larger bones may be considered as the great pillars of a building:—the muscles, or the fleshy parts, as so many cords to bring every thing into motion. The arteries and veins, as the streams of refreshment and the springs of life.

The heart, in the middle, as the fountain or working machine, conveys the blood, which is the nourishment of the body, by means of the arteries, to the extremities, which is returned back by the veins; and the continual pulsation of the heart keeps up the perpetual circulation of the blood. The lungs are instruments to admit good air to cool and refresh the blood,

and to let the air out when it has performed its office.

*Son.* If the blood be that which supplies the body with nourishment, you can perhaps tell me how the food which we take becomes changed into blood?

*Father.* When the food has descended into the stomach, it there meets with a certain liquor called the gastric juice, which mixing with the food, dissolves it into one mass called chyme.

*Son.* Does the gastric juice melt down all kinds of substances which enter the stomach as food?

*Father.* All are dissolved by it, however different in their natures: the flesh of animals, the seeds and stalks of the greatest number of plants, the roots and leaves of many; and even foreign substances, such as iron, have been found to yield to its power—and yet, strange as it is, the fluid which does all this, which is stronger in its effect than aquafortis itself, is as mild to the taste as gum water; and still more strange, it does no injury to the coats of

the stomach, though it acts so powerfully on every thing that enters it. This chyme, by another process of digestion, becomes chyle; which is a milk-like substance, and on its passage along the intestines, meets with the mouths of a number of little vessels which suck it up as it proceeds, and at length pour it into the veins in the form of blood, the proper aliment for the body. The further detail of this process would, I fear, be unintelligible to you.

*Son.* Have you any thing more particular to observe here?

*Father.* It is worth attention to remark, that the skin of the hand becomes thicker, that it may not be worn out by working, and yet does not entirely lose its feeling. The same may be observed of the soles of the feet. And to crown and perfect the human fabric, the whole body is covered with a fine skin, as a curiously-wrought upper garment without a seam; through which are an infinite number of invisible spiracles, or apertures, which we call pores.

*Son.* Of what particular use are these pores?

*Father*. Through these evaporate the superfluous moisture of the body, which we usually term perspiration; the regularity of which is so necessary for the health of the body, that when perspiration is stopped, it throws the body into uncommon heat, which we term a fever, and which is so often fatal. Exercise and cleanliness are the best promoters of this necessary perspiration.

## DIALOGUE XII.

### OF THE INTERNAL PART OF THE HUMAN BODY.

*Son.* I SHOULD now be glad if you would give me a clear idea of those parts of the body which are not visible to the eye—I mean its internal parts.

*Father.* The principal internal parts are:—first, the stomach, a wide paunch, in which the food (that has been chewed in the mouth) is dissolved. To facilitate the dissolution of which, it receives in its progress a liquor from the gall bladder. The next things observable are, the bowels, which receive the food from the stomach, push forward the softer parts, and absorb all the fine juices, by means of numerous absorbent vessels called lacteals, which are placed in the bowels, and are of curious construction. The bowels are, in a middling-sized person, near thirty feet long, but by their various foldings take up but a small compass.

*Son.* What becomes of the grosser parts of our food?

*Father.* When all the nourishment is drawn from it, those grosser parts pass onward to be discharged from the body.

*Son.* And how, or in what manner, is the body nourished by food?

*Father.* The fine juices (called chyle) are conveyed, by means of the thoracic duct, to the heart, to be formed into blood.

*Son.* How is all this work effected?

*Father.* The heart receives these juices, and injects them into the lungs, and the lungs press and prepare them. The air drawn in by the lungs, passing through the windpipe, carries off the inflammable parts in the act of breathing, and the lungs return the juices back to the heart; and they are thus converted into good blood, which nourishes the whole body.

*Son.* What gives the blood its motion or circulation?

*Father.* In that lies the grand secret termed life.—The heart has the power of opening and of closing its cavities, which we call its expan-

sion or contraction: and as long as this continues, we live. By the former the blood is brought in, and by the latter sent out into a duct, called the great artery. It is supposed the pulsations of the heart are more than two thousand every hour, whether we wake or sleep.

*Son.* I am lost in wonder and admiration!

*Father.* Adopt the words of the Psalmist, who was much employed in meditating on the works of God—"I will praise thee, for I am fearfully and wonderfully made. Marvellous are thy works, and that my soul knoweth right well."

But I have one thing more to call your attention to, which will also excite your astonishment. It is this, if the blood (which is brought again into the heart, into its other cavity, from the extremities of the body and limbs through the veins) were ever to flow back, we should die; but this is prevented by small sluices, or valves, placed in the veins, which permit the blood to pass forward, but effectually prevent its return.

*Son.* David might indeed well say, that we are "fearfully and wonderfully made."

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## DIALOGUE XIII.

### OF THE HUMAN SOUL.

*Father.* HAVING spoken so largely of the body, I shall now proceed to give you some account of the soul. This is far superior in excellence and dignity to the body, on account of its spiritual nature, its intellectual and moral powers, and its immortal duration.

*Son.* What are those powers?

*Father.* They consist in forming ideas, thinking, reasoning, judging, and willing. And it possesses, besides, the powers of memory and imagination.

*Son.* Is not the soul susceptible of joy, love, desire, and hope?

*Father.* Yes; and it also feels pity and compassion.

*Son.* Are these beneficial to us?

*Father.* Without doubt, when under proper regulation. Under divine influence, they encourage us to moral and pious actions. But, if they are not under proper discipline, they lead us to much evil, and expose us to great injury. "He that hath no rule over his own spirit is like a city that is broken down, and without walls."

*Son.* Is it known how the soul is united to the body?

*Father.* That surpasses the conception of the wisest philosophers.

*Son.* But must not man die, though such a noble creature? What a pity that so noble a fabric should crumble to dust!

*Father.* Every day's experience proves our mortality; but the gospel gives us the strongest assurance that good men will be raised again, and placed in a state of happiness that will never end.

*Son.* As men are dying perpetually, is there not some danger of the world's losing all its inhabitants?

*Father.* Though from calculations which have been made, sixty are supposed to die every minute, yet more than sixty are supposed also to be born every minute; and for every hundred females born into the world, there are also born one hundred and five males, as more of the latter are supposed to die in early years than of the former, and they are more subject to casualties.

*Son.* Do more men die in the country than in very populous cities?

*Father.* More in cities; because there the air has not that free circulation it has in the open country, consequently it is not so pure for breathing: besides, infectious disorders more easily spread their baneful influence, and are more readily communicated, when habitations are so contiguous to each other, and the streets and lanes are very narrow, and crowded with inhabitants. But wherever we live, whether in town or country, we breathe God's air, we enjoy his light, we live upon the produce of his earth—in short, all that we have is the Lord's. It must, therefore, be manifestly our

duty to serve him both with our bodies and our spirits, which proceed from him.

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## DIALOGUE XIV.

### ON LAND AND WATER.

*Son.* WOULD not the earth be more beautiful if it was one smooth, extended plain, without hills and mountains—do not the mountains disfigure it?

*Father.* By no means, Do you think the dust that falls upon the geographical globes disfigures them? The mountains are no greater, in comparison with the whole earth, than the dust to the globes, or the roughness to an orange. Without mountains we should have no springs nor rivers: they receive the vapours, the rain, and the snow, which supply the springs with water. Mountains are the grand magazines of metals, minerals, marble, stone, &c. and beside attracting the clouds, they

shelter the lowlands and vallies from the bleak and cold winds.

*Son.* What is the advantage of the round figure of the earth?

*Father.* One advantage at least is quite obvious; namely, that it is the one best adapted for the commodious and equal distribution of the waters. For, since it is the nature of water to settle down into the lowest place, if the earth were any other form than round, it would follow, that one part would be drowned, and another be too dry—but by being round, such evils are prevented.

*Son.* Suppose that the shores of the sea were lined with a high mountain ridge, would it not make a barrier against the wind, and shelter the land from those storms which sometimes sweep over the earth with such violence?

*Father.* By such an arrangement there cannot be a doubt but the currents of air would be much retarded, if not wholly stopped. We find by experience what influence high mountains have upon the winds—how they stop some, retard others, and change even the ge-

neral and constant winds which blow in the torrid zone, or middle parts of the earth:—doubtless they would form such a barrier as would greatly disturb or rather absolutely stop the currents of the atmosphere; but they would thereby deprive us of those salubrious gales which keep it sweet.

*Son.* What is the use of those sand-hills which are so numerous on the coast of Holland, and upon which nothing grows?

*Father.* They serve to hinder the boisterous waves of the sea from overflowing the Low Countries. This is worthy your reflection, that small grains of sand, which you can blow away with your breath, when thrown into a mass, form such a strong barrier against the raging ocean. "Will ye not tremble," saith the Lord, "at my presence, who have placed the sand for the bound of the sea, by a perpetual decree that it cannot pass it—and though the waves thereof toss themselves, yet can they not prevail—though they roar, yet cannot they pass over it?"

*Son.* I should wish now, if you please, to

turn my thoughts from the land to that great body of water, the sea. What is there worthy my observation?

*Father.* Its extent, its depth, its saltness, its ebb and flood, and its limits or boundary.

*Son.* In looking upon the map of the world, it appears as if the sea covered a great deal more surface than the land?

*Father.* It is computed to cover three times as much.

*Son.* Don't it seem a pity that so much land should be covered with water?

*Father.* Remember that the earth was made by an all-wise and Almighty Creator, and you will not need to be assured, that the arrangement which he has made is the best. You know how much communication is promoted between distant countries by means of seas, enabling the inhabitants of different climates to exchange the commodities which are peculiar to each. But besides, the great oceans and the seas are so admirably distributed throughout the globe, as to afford sufficient vapours for clouds and rains to temper the cold of north-

ern regions, to cool and moderate the heats of the middle and warmer parts of the earth.—However, suppose the cavities which contain the sea were deeper, although the water was no less in quantity, the evaporations which rise from the surface would be so much the less—the rivers which fertilize our lands would become dry—the springs would stagnate—and mankind would perish with thirst.

*Son.* What am I to understand by the ebb and flood of the sea, or the rising and falling of the tide, as it is commonly called?

*Father.* That this amazing collection of waters rises every six hours, more or less, which is called flood—and, after a very short time of rest, falls again, which we call the ebb.

*Son.* What is the cause of this regular movement of the waters, and what is its use?

*Father.* The ebbing and flowing of the sea are supposed to be occasioned by the motion of the earth, and the attraction of the sun and moon, which you will be better able to comprehend when you grow older. This movement of the water preserves it from corruption,

which would take place if it were in a state of rest and stagnation. The tides are also exceedingly useful to navigation and commerce.

*Son.* Is not the depth of the sea very great?

*Father.* It is not of equal depth—in some places navigators can find no ground with a line of more than seven hundred and eighty fathoms.

*Son.* Why is the sea so deep?

*Father.* God, who meted out the heavens with a span, also measured the water in the hollow of his hand—he adjusted it in wise proportion no doubt to the land—and for this reason it may be so large and deep. By its depth it contains much more water, and there remains so much more dry land.

*Son.* Why is it so salt?

*Father.* To preserve it pure, and to yield us so valuable an article of life.

*Son.* Does the sea then produce salt?

*Father.* A great quantity of salt is taken out of holes dug on the sea-shore, from whence sea-water is exhaled by the sun, leaving behind the salt which it contained.

*Son.* How beneficial is the sea to man!

*Father.* But surely you have not forgotten the great benefit man receives from that vast inexhaustible store of fish which it contains, great and small, from the whale even to the shrimp: for even those which are not good for food, are useful for the wants and conveniences of life. Neither, surely, have you forgotten the extensive general benefits of commercial intercourse, carried on upon its surface, between the most distant nations of the earth—the support which it is the means of affording to ship-builders—and for so useful a body of the community as sailors.

*Son.* What confines and keeps the sea within its proper bounds?

*Father.* The Divine ordinance. The same all-creating Word which said, "Let there be light, and there was light," said also to the raging sea, "Hitherto shalt thou come, but no farther; and here shall thy proud waves be staid."

*Son.* What an immense quantity of vapour must be raised out of the sea to supply the

springs, which form so many great rivers in every quarter of the world!

*Son.* What is your opinion of fire?

*Father.* It is as necessary and useful as air and water.

*Son.* Where do you acquire it?

*Father.* It lies hid almost in every thing, because we have continual need of it—there it remains in a state of rest—but when it is brought out of its resting place, it spreads itself amongst fuel, whether of wood or coals. It melts and softens the hardest metals, evaporates moisture, boils and roasts our meat, and warms our houses in the cold months of winter. Without fire, having no candles, lamps, or torches, we should be without light too, as well as without warmth and heat.

## DIALOGUE XV.

### OF ANIMALS.

*Son.* I SHOULD now wish to know something of the animal creation.

*Father.* There are several hundred thousand sorts of living creatures. Some live in the water, some on the earth, and some in both, (which last we call amphibious,) and others are inhabitants of the air—but all are subject to the reason of man.

*Son.* Why are they subject to the reason of man?

*Father.* That they may be made useful to us; which otherwise they could not be, because of their superior strength.

*Son.* Have animals senses as we have?

*Father.* The four-footed beasts have five, and some of them are stronger than ours; for instance, the smell in hounds, and the hearing in moles.

*Son.* How are so many millions of creatures supported and preserved?

*Father.* Every day a table is, as it were, provided by God's providence for so many guests. Care is also taken that we cannot annihilate any one species of food which God has created.

*Son.* Is there any thing farther to be observed?

*Father.* All have the weapons of defence; and they know, when they are sick, what will relieve them. They know the element in which they are to live, and their proper food; they know how to build their habitations, (of this kind the beavers seem to approach the nearest to human sagacity) they are able to distinguish their enemies, and to understand each other.

*Son.* If they understand each other, have they then a language peculiar to themselves?

*Father.* They have: this appears from the different sounds lions, bears, wolves, horses, &c. make in different situations.

*Son.* Have they passions like ours?

*Father.* Yes; they have affection, joy, grief, sympathy: they have manifestly anger and resentment, jealousy, &c. It may here also be observed, that the nature or disposition of each remain the same; the horse is spirited and full of fire, the lamb mild and gentle, the hare timid, and the dog watchful and faithful to his master.

*Son.* Oh how much are we indebted to our kind Creator, who has made all these subservient to us!

*Father.* And our thankfulness should rise still higher when we reflect, that these living creatures are not only designed for our use, but for our food also, at least the greatest part of them. This consideration should induce us to treat the brute species with lenity—cruelty to them is ingratitude to God, who formed them. On the contrary, we ought to take all proper care of them, and to give them whatever is necessary for their support; and never to injure them by too severe labour and fatigue. "Thou shalt not muzzle the ox when he treadeth out the corn." And again, "A righteous man regardeth the life of his beast."

*Son.* But of what use are the wild beasts of the forest?

*Father.* They are all serviceable in some degree; some for food, others for clothing. The ravenous beasts of prey may prevent the too great increase of other noxious animals; the wild beasts of the forest may also prevent man from retiring into deserts, and banishing himself from society and from usefulness. They serve also to shew us the greatness and variety of God's works, and the fine gradation there is from the smallest of the animal tribe up to the lion, the elephant, and the rhinoceros; and to shew us that Providence extends its care even to the inhabitants of the wilderness. "Thou makest darkness, and it is night, wherein all the beasts of the forest creep forth. The young lions roar after their prey, and seek their meat from God."

## DIALOGUE XVI.

### OF ANIMALS.

*Son.* I SHOULD much desire to know how it is that animals, in general, can distinguish the kinds of food which are suited to the appetites and wants of each?

*Father.* In man there is the faculty of reason, which sufficiently guides him in the choice of that kind of food best suited to his wants, and in the rejection of others which would be injurious; but, for the inferior creatures, who want reason, instinct is an unerring guide, which amply compensates the want of the reasoning faculty.

*Son.* Will you give me some examples of that inward principle, which you say cannot err in its directions?

*Father.* Wonderful and conclusive as is the proof of divine wisdom, power, providence, and care, in the instinct of animals, it would

be impossible, with any brevity, to mention all the ways in which it shows itself.

*Son.* There are some, no doubt, whose food is near at hand, who have but little need of instinct to guide them.

*Father.* Yet, even in them, instinct is at hand to assist the smell and taste in choosing such things as are salutary, and rejecting those that are pernicious. But if we consider those animals whose food is not so easily come at—with what power and art do some of them hunt after and pursue their food—with what sagacity do others grope for it under ground, out of sight, in marshy places, in mud and dirt. What an admirable faculty is that of many animals, to discover their prey afar off—some by their smell, at the distance of many miles; some by their sharp and piercing sight, aloft in the air! "Doth the eagle," says Job, "mount up at thy command, and make her nest on high? She dwelleth and abideth on the rock, upon the crag of the rock, and the strong place: from thence she seeketh her prey, and her eyes behold afar off."

*Son.* Do all animals live on one kind of food, and prefer it in the same state?

*Father.* So far from it, that what is wholesome food to one, is nauseous and as a poison to another; what is sweet and pleasant in smell and taste to one, is fetid and loathsome to another: so that not only is every creature well provided for, but a due consumption is made of those things that would otherwise encumber the world, corrupt, rot, and annoy, instead of cherishing and refreshing it. For sometimes our most useful plants, grain, and fruits, would mould and rot—those beasts, fowls, and fishes, would turn to carrion, and breed diseases, were not these very putrefactions sweet, pleasant, and wholesome food to some creature or other, in the place where those things fall; to ravens, vultures, and other voracious animals, for instance, on the earth; and to rapacious fishes, and other creatures, inhabiting the waters.

*Son.* Our Saviour himself, I remember, alludes to the raven, as being the object of divine care, where he says, "Consider the

ravens, for they neither sow nor reap, which neither have storehouse nor barn, and GOD feedeth them."

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## DIALOGUE XVII.

### OF FISHES.

*Son.* BUT do not the waters appear a very unlikely element to produce food for so great a number of creatures as have their support from them?

*Father.* And yet it is the waters which most abound in animal life; and it is precisely in them that animals appear to be most plentifully supplied with food, as is manifest from the fatness of their bodies, and the gaiety and briskness of their movements.

*Son.* Whence, then, do they derive their food?

*Father.* There are, first, various water plants; next, the various kinds of insects, which, though they belong to the air and land, yet delight to be about the waters, and by that means become a prey and give a plentiful supply of food to their inhabitants. Behold also, what prodigious shoals of minute animals are found therein: sometimes in such abundance as to discolour the waters. In the summer months, the green scum, which lies on the top of stagnant waters, is nothing but an almost infinite multitude of animalcules, giving food not only to water animals, but also to many of the larger kind of insects. Think also how prolific are fish—millions being produced by the cod, and hundreds of thousands from the herring and others: these all feed on each other, the larger on the smaller, and yet they are in such quantities as to give food to man—as the inhabitants of a sea-coast may well know.

*Son.* When the kinds of food are so va-

rious, the organs for gathering, preparing, and digesting the food, must be various too?

*Father.* They are so indeed; and yet all contrived, made, and disposed with the utmost dexterity—and so curiously adapted, also, to the place in which the animal lives, and the food it is to be nourished with.

*Son.* Suppose we begin with the mouth.

*Father.* How variously shaped, for the gathering and receiving the food. In some creatures, wide and large; in others, little and narrow. In man, the strength is not in his mouth, because he has the faculty of reason to assist him in catching and preparing his food; but in lions, wolves, and dogs, the mouth is long and deep cut, the teeth strong and sharp, for the purpose of tearing their food, as well as of holding it tenaciously.

And then in insects—how remarkable is the variety of structure, some forcepted, or made like tongs, to catch hold of and tear their prey; in others, needle-shaped, to pierce and wound animals, and suck their blood; in others, strongly furnished with jaws and teeth, to gnaw

and scrape out their food, to perforate the earth, the hardest wood, nay even stones themselves.

And again, in birds, how neatly shaped is the bill or mouth, for piercing the air, and making way for the body through that element. In some species, hard and horny, to supply the want of teeth, and cause the bill to perform the office of a hand: in the rapacious kind, hooked, for the purpose of catching and holding their prey: in some, of extraordinary length and slenderness, in order to search and grope for the food in moorish places: in others, thick, short, and sharp-edged, when they have to husk the grain they swallow: in others, cross-formed, where they have to break open fir cones and nuts to come at the kernels, which are its food; and in others, compressed, as for example, the sea-pie, which makes use of its bill as an oyster-knife, to raise limpets from the rocks—with many others, too numerous to mention, though all sufficiently indicate their fitness for that kind of food on which each of them lives.

## DIALOGUE XVIII.

### OF ANIMALS.

*Son.* HAS each kind of animal its peculiar place of abode?

*Father.* There is nothing more wonderful than the manner in which the infinitely wise Creator hath appointed to each kind of animal the place in which it should move and act.

*Son.* I understand very well that the sea is the place for fish; the air, that in which birds and winged insects move; and that the surface of the earth is allotted for land animals: but is there any more particular arrangement of Providence with respect to the habitations of animals?

*Father.* Had all animals been created capable of living in any clime, or in only one clime, consider what would have been the consequence: one animal would have wanted food—another, habitation—and most of them, safety—they would all, perhaps, have flocked

to one or a few places, and so would have starved, or at least greatly incommoded each other. But as the matter is now wisely ordered, the earth is equally overspread, so that no place wants its proper inhabitants, nor is any creature destitute of its proper place, and all things necessary to its life, health, and pleasure. As the surface of the globe is covered with different soils, with hills and valleys, with seas, rivers, lakes and ponds, with divers trees and plants; so all these have their animal inhabitants, whose organs of life and action are manifestly fitted to such and such places and things; whose food and physic, and every other convenience of life, is to be met with in that very place appointed for it. The watery, the amphibious, the airy inhabitants, those on the dry land's surface, and those who live under the surface, all live and act with pleasure; they are all lively, and flourish in their proper elements; they want neither for food, clothing, or retreat.

*Son.* Methinks, Sir, man is an exception to this rule; for I have met people of different

and distant parts of the world who had taken up their abode among us—and we know, that there are many productions of other countries which do not grow amongst us, and which we are obliged to have brought to us in ships.

*Father.* Your observation is a just one, and shews me that you give your mind to the subject on which we are speaking. The whole earth was given to man for his habitation, and he may reside where he pleases, and change his residence as often as he pleases—this, however, is with some modification. Those who live in the frozen regions of the earth are better fitted, perhaps by habit, for bearing the cold; whilst an inhabitant of the temperate zone, if he goes to the middle parts of the earth, is a long time before he can bear the heat, though to the natives of that place it is not at all excessive.

*Son.* Man, however, has reason to direct him.

*Father.* And this faculty teaches him to adopt such precautions as guard him from the effect often produced by a sudden change of

climate. If a native of these countries goes north, he puts on warmer clothing; if he goes south, into the torrid zone, he does not all at once expose himself to the scorching sun, but uses such measures as moderate the intense heat.

*Son.* Now I understand why the lower animals are not capable of this—they have instinct only to guide them.

*Father.* Just so—and besides, their formation adapts them to the countries which the Creator designed for their habitation. The camel, which lives in the sandy and dry deserts of Africa, has a wonderful capacity for enduring thirst, and is provided with an additional stomach, in which he can lay up a store of water for his time of need. The quadrupeds of frozen countries are covered with a warmer fur—the birds which seek their food in the water have the breast defended by a finer down—whilst the insects of warmer countries find there, and there alone, the food in which they delight.

*Son.* Is there no reason to fear, that ani-

mals should increase to such numbers that they shall at last perish from hunger?

*Father.* Here again is to be admired the wisdom of the world's Creator. The life of some creatures is long, but their increase is small; and by that check they do not overstock the countries where they live: of others, the increase is great, whilst their life is but brief, and they are food to man or other animals.

*Son.* Insects, however, increase and swarm in their proper season, and they are not in general food for man.

*Father.* Not for man, but for other animals; and they live but for a short time, some but for a day.

*Son.* We read in the Bible that the life of man was formerly prolonged even to eight or nine hundred years.

*Father.* In the beginning of the world, when it was to be peopled by one man and one woman, human life extended to that period, and it is a special instance of divine Providence; but when the world was more peopled, the prolongation of life was not necessary, and ac-

cordingly the age of man was reduced to about one hundred and twenty years. And lastly, when mankind had increased, as in the age of Moses, and so down to our present days, the lessening of the age of man to seventy or eighty years, (as mentioned by the Psalmist, Ps. xc. 10) is manifestly an appointment of the same infinite Lord who ruleth the world. Were the age of man extended to that of Methuselah, nine hundred and sixty-nine, or only to that of Abraham, one hundred and seventy-five, the world would be soon overstocked with inhabitants: or, were it limited to that of sundry other animals, to ten, twenty, or thirty years only, the decays then of mankind would go on too fast. As it is, however, the balance is kept up—sufficient room being left for population to increase, where the means of support are sufficiently plenty: and on the other hand, the limitation of life's continuance to three score years and ten, as well as the many causes which curtail even that period, guard against the increase of population beyond what the earth could supply with food. In all this is

seen the ordering of Almighty Wisdom and Power, in whose hands are the issues of life and death. "THOU hidest thy face, all creatures are troubled: THOU takest away their breath, they die, and return to their dust: THOU sendest forth thy Spirit, they are created, and thou renewest the face of the earth." (Psalm civ. 29, 30.)

## DIALOGUE XIX.

### OF ANIMALS.

*Father.* WHAT a commodious provision hath the Almighty made for animals that are obliged to climb for food, not only in the structure of their legs and feet, and in the strength of their tendons and muscles, but also in the peculiar structure of those parts which act in their search for food.

*Son.* I suppose, then, we never find an animal which is directed by instinct to seek its food by climbing, hunting after it on the ground; nor one which hunts its prey on the ground, seeking it in the branches of a tree?

*Father.* Each of them is true to his instinct, and as it never misleads, so he never disobeys its impulse.

*Son.* I should like to hear some instances.

*Father.* What, then, is more remarkable

than that provision, in nocturnal birds and beasts, in the peculiar structure of the eye, whereby they are enabled to discover their food in the dark?

The most remarkable, however, is that natural affection which almost all animals feel towards their young—with what alacrity do they fulfil their parental functions, thinking no pains too great to be taken for them; no dangers too great to be ventured upon for their defence and security—how carefully will they lead them about in places of safety, and carry them into places of retreat where they may be free from harm—some of them admit them into their own bowels*—how will they caress them with their affectionate notes; lull and quiet them with their tender parental voice; put food into their mouths; suckle them; cherish and keep them warm; teach them to pick and eat, and gather food for themselves—and, in a word, perform the part of so many nurses, deputed by the sovereign Lord and Preserver

* As the viper.

of the world, to help such young and thriftless creatures, till they are come to that maturity as to be able to shift for themselves.

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## DIALOGUE XX.

### OF BIRDS.

*Son.* WILL you now be so kind as to speak of the feathered tribe? I am delighted with the sweet notes of birds.

*Father.* To enjoy this pleasure undisturbed, we must rise early in the summer season.

The production and the structure or formation of a bird call first for your attention.—Observe how it acquires its existence, out of that matter or substance with which an egg is filled; and this effected, after it has been impregnated, only by a brooding heat. The

structure of birds is also curious, and a proof of great skill and wisdom. How well adapted is their form for flying! the substance of their bones is much thinner than that of land animals, that they may be lighter, and better able to mount in the air. And, that the thinness of the bones should not render them weaker, the substance of the bone itself is stronger and harder.

With their pointed beak they can more easily cut the air: but what is most observable in birds is, their being capable of flying in the air, and some of them with amazing rapidity; for which purpose their wings are curiously constructed. But the flight of birds is what we see almost every hour, and therefore, like most other things that are common, it escapes our notice.

*Son.* Our motion upon the earth from one place to another, with so much ease, and this too almost without our thinking of it, might well excite our admiration at the wisdom of our Creator; but the motion of birds in the air is still more surprizing—and I long to know something farther of the structure of their

wings, and in what manner they move and suspend themselves in the air.

*Father.* I am glad to find in you an increasing desire for knowledge: but this, with many other things which we have only just touched upon, you will be better able to comprehend a few years hence.

*Son.* I thank you; but will you tell me more now?

*Father.* You were just observing that you are much pleased with the singing of birds: and does it not strike you with admiration too, that the tender throats of such small creatures, and those of the male particularly, should be able to form such shrill and variegated notes, while a great ox, or bull, can only bellow and roar. It is observable farther, that as they have to fly through the woods, they are provided with a membrane to protect the eye, which we have not: and also, that their ears are placed more within, and covered with feathers, to guard them against the pressing wind.

*Son.* I do not perceive that birds have any teeth to chew their food.

*Father.* True—but to break their food small, they have beaks as tough as horn, which are very long in those that fish under water, shorter in those that peel seeds, and hard as iron in those of a stronger contexture.

*Son.* Do they not sometimes perish for want of food?

*Father.* I believe not for want of food, unless in some extraordinary cases. "They sow not," saith our Lord to his disciples, "neither do they reap, nor gather into barns; yet your heavenly Father feedeth them." And what is worthy your notice here, is, that those birds, which lay not up any store for winter, are always reasonably provided for: not even the sparrows are forgotten before God. "He giveth to the beast his food, and to the young ravens which cry." Those birds which find not their proper food in one country, fly to another—these we call birds of passage; such as the stork, the crane, the swallow, the woodcock, the turtle, and some others, which leave their own country at stated periods, to go

to more favorable climates, and return again on the change of the season.

*Son.* That is truly amazing! How can they find their way over different kingdoms and seas?

*Father.* They have that knowledge which we call instinct. "The stork in the heaven knoweth her appointed time; and the turtle, and the crane, and the swallow, observe the time of their coming."

## DIALOGUE XXI.

### OF FISHES.

*Father.* To what shall we next turn our attention? Suppose we now take a view of the inhabitants of the watery world. What think you of creatures living in an element which would be fatal to us, and which could not live upon the earth as we do? Water is the dwelling-place of millions of fishes.

*Son.* How diversified are the divine works!

*Father.* So exclaims the Psalmist—"O Lord, how manifold are thy works! in wisdom hast thou made them all! the earth is full of thy riches! So is the great and wide sea, in which are things creeping innumerable!"

The structure of fishes is entirely opposite to what is proper for the flying of birds. Dif-

ferent means must necessarily be applied to make birds and fishes move upwards and downwards in their different elements. A smooth, long body, thick before, and gradually diminishing in bulk behind, is the best formed for swimming—and of this form are fishes.

*Son.* How do they breathe?

*Father.* Not as we do; for the air comes in through the mouth, and goes out through the gills.

*Son.* Have they senses?

*Father.* The nostrils show they have the use of smelling. Their feeling too is finer than ours, because they sooner perceive the changes of the weather. Neither is their sense of sight prevented by the water, for which purpose their eyes are differently constructed from ours.

*Son.* Of what use are the scales of fishes?

*Father.* To preserve them from being bruised or crushed by bodies striking against them, and to guard them against the cold.

*Son.* How do they dart forward so nimbly in the water?

*Father.* By means of their tail, by the motion of which they push themselves forward.

*Son.* Of what use are the fins?

*Father.* To keep them in equilibrium, or with their belly downward; to turn on either side, or to stop their progress.

*Son.* By what means do they rise or descend in the water?

*Father.* They are enabled to do this by a white air-bladder, which they can dilate or contract at pleasure.

*Son.* How does that occasion their ascent or descent?

*Father.* Because, in the first case they are lighter than water; and in the latter, heavier.

*Son.* How are they supported?

*Father.* They eat worms, and flies, and plants. And the large fish feed upon the smaller, of which our bountiful Creator has given such a vast increase, that the spawn of a perch would produce more than twenty-eight thousand. "And God said, Let the waters bring forth abundantly."

*Son.* Are there any fish which migrate in

the water, as birds of passage do in the air, at certain seasons?

*Father.* Yes; such as the sturgeon, salmon, herring, smelt, pilchard, and others—some of which come from the sea into our rivers, and others are found in shoals, in certain parts of the ocean, and at certain times of the year; to which they are, no doubt, led by what we usually term instinct.

*Son.* What a vast store of provision is here laid up for man!

*Father.* Thus you see how good and bountiful God is to us—"He has put all things under our feet: all sheep and oxen; yea, and the beasts of the field, the fowl of the air, and the fish of the sea, and whatsoever passeth through the paths of the sea. O Lord! our Lord! how excellent is thy name in all the earth!"

## DIALOGUE XXII.

### OF INSECTS.

*Father.* LET us now take a view of the smaller part of the living creation. What think you of those called insects?

*Son.* I cannot say I ever thought much about them.

*Father.* But we should not overlook any part of God's creation.

*Son.* Where do insects live?

*Father.* Every where—in the air, the earth, the water, in wood, in stone, in shells, in mud, and in sand.

*Son.* On what do they live?

*Father.* Upon almost every thing—upon flesh, fish, flowers, herbs, filth, and dirty slime, which is often seen upon the water in summer.

*Son.* What parts of an insect are most to be admired!

*Father.* Their fine beautiful eyes. their wings, their colour, their offensive and defensive weapons, &c. If you look through a microscope, you will find, that what we thought to be dust on the wings of a butterfly, consists of a number of beautiful feathers, arranged in great order. The legs also of insects are worthy of peculiar attention. Those of a fly, for instance, by which it can walk up a window perpendicularly, or horizontally upon a ceiling.

*Son.* How can they do that?

*Father.* By means of a glutinous matter, which enables them to keep their hold. But besides this, many bodies which appear plain and smooth to the naked eye, have a roughness, which their small and tender feet can catch hold of.

*Son.* How are they propagated?

*Father.* By eggs, which they carefully hide in the most secure places in great quantities.

*Son.* Are not many insects injurious?

*Father.* Some no doubt are. The locust,

caterpillar, and some others. But that these may not be too numerous, great multitudes of them are destroyed by birds. But even caterpillars, which we deem so pernicious, are yet very serviceable. And I doubt not, but many other insects are useful for purposes of which we are ignorant.—The several members of this little tribe are (with some few exceptions) very industrious. From the labour of bees we receive our honey and our wax: the former being lodged in warm apartments of their own forming.

*Son.* And how can those creatures do what man cannot do? how can they make honey?

*Father.* By flying abroad, and collecting together the very fine essence of flowers, both of the field and of the garden; which is done by their trunk, with which small tube they suck up the delicious syrup as nature produces it, and then deposit it in cells.

*Son.* Do they each know their own cell, and keep to that as their constant place of residence?

*Father.* Bees are like a well-ordered community. They have a sovereign bee, to whom they are all under subjection. The laws and regulations of this industrious tribe are generally submitted to, and punctually observed. They all labour for the common good, and mutually assist each other. In short, man himself may from them receive much instruction.—Their hastening to their hives in great numbers is a sure sign of rain.

*Son.* Is it not cruel to put to death a whole community? and unjust to seize the fruits of their labour?

*Father.* There is no injustice in appropriating the fruits of their labour to our use, because, by their making more honey than they want, we perceive that a part was designed for us. And with respect to putting them to death, why may we not as well put these to death as an ox or a sheep? However, there is a method of taking the honey without destroying the bees—and this is certainly the best.

*Son.* But how can they subsist during the winter, if we deprive them of their honey?

*Father.* We always leave them what is sufficient, or supply them as they are in want. So that what we take may be considered as a kind of superfluity, which they can well spare.

*Son.* Are not ants, too, remarkable for their industry, regularity, and order?

*Father.* They are a little people united like the bees; but may rather be termed a commonwealth, than a monarchy. Their sagacity is very conspicuous in the various methods they use to procure food, and their friendly contrivance to carry it home. The food they store up so carefully is probably for their young, when they first come out of the egg, for in the winter they are supposed to be in a torpid state.

*Son.* I have heard, I think, something remarkable concerning caterpillars.

*Father.* Besides their beautiful form, in their first state, after some time they change their coat, and become beautiful butterflies.

*Son.* But do not they produce our silk?

*Father.* Without doubt: they are silk manufacturers. This they make of a gum, which they have in their inside, in a small bag or bladder. In goldsmiths' shops you may probably have seen iron plates with holes, through which they draw the gold wire to its proper size: the silk-worm has, under her mouth, something resembling such a kind of perforated instrument, through which she draws the gum. This supplies the materials out of which she spins her thread, and by passing through those holes, it receives its form and length.

*Son.* How useful are these insects, which we are apt to despise!

*Father.* More useful in their humble sphere than some of the human species themselves.—All useless members of society may learn a lesson even from the tribe of insects.

*Son.* Are spiders of any use?

*Father.* Our aversion to spiders arises from their ejecting a poisonous matter, with which they kill their enemies: but I believe the quantity they can eject, though fatal to insects,

would not produce to us any great injury.—Spiders are not without their use: they catch and destroy many flies—the webs which they spread over the trees in summer, in some degree preserve the fruit—and they may be more useful in our houses than we are aware of. The webs which spiders form, particularly in gardens, are exceedingly curious.

*Son.* How do the field spiders carry their first thread from tree to tree, or across the lanes, as we often see in the summer?

*Father.* Some have thought that the spider must fly, to do this; but she transports herself in this manner:—

She places herself upon the end of a branch, or some other projecting body, and there fastens her thread: after which, she presses out more long threads, which she leaves floating in the air: these threads are wafted by the wind from one side to another, and are there fastened by their natural glue: she afterwards draws them to her, to try if they are well fixed,

and then they become a bridge, over which the spider passes and repasses at pleasure.

Others are of opinion, that as these are often seen when there is no wind to waft them over, that after having fixed the thread on one side, dropping then to the ground, they carry the thread themselves; and mounting where they want to fix it, there draw and fasten it.

*Son.* I have often wondered how snails build their habitations, which they carry about with them.

*Father.* Their carrying their own habitations with them is somewhat singular: I am not surprized that your inquisitive eye should have noticed it.

Every animal in nature has its habitation. The roof under which the snail resides has two properties, which appear difficult to be united, solidity and lightness; without which its inhabitant could neither be protected from injury, nor transfer its habitation from place to place. At the approach of winter, she retires into some cavity, and from her body exudes a cer-

tain glutinous matter, which closes up the aperture of the shell. Thus shrouded up, she passes the cold season in safety. When the spring season commences, she opens her door, and ranges at her pleasure.

*Son.* I do not perceive that they have any feet.

*Father.* To show the diversity of the divine works, they have two large muscular skins, which they can lengthen and contract at pleasure, by which means they move, and draw their castle, which rests upon their backs. And to prevent accidents, they are provided with a viscous humour, which, by its cohesion, secures them from falling, and renders them impenetrable to moisture, by an oily matter, with which they close up all the pores of their skin.

*Son.* And now please to inform me how their shell is made.

*Father.* The snail has a very small shell, rather soft, when she leaves the egg: this shell forms the basis of a second, which is gradually increasing.—The first is the centre of the

other, and the whole is formed by adding new circles to the first shell. And as her body can only be extended towards the aperture, this must consequently be the part which receives the fresh accessions. The materials from which the shell is made are lodged in the body of the animal, and formed by a viscous fluid, and sandy particles of exquisite fineness, which thicken into a consistence round the extremity of the shell, and become incrustated. This will also give you some idea how the shells of different fishes are formed.

# DIALOGUE XXIII.

## OF INSECTS.

*Son.* Do insects show the same natural and instinctive affection for their young that other animals do?

*Father.* No; and for a reason which must excite still more our admiration of that Being who does nothing in vain. The insect race are so generated as to need none of their parents' care; indeed they are so numerous that they could not receive it—but the reason is, that they arrive almost immediately at their perfect adult state, and are able to shift for themselves. And yet, thus far their parental instinct extends, they do not wildly drop their eggs any where, but so cautiously deposit them, (some on the

waters, some on the skins of living animals, some on plants, proper and agreeable to their future progeny,) that their young, on bursting the egg, find such food as is required to bring them up till they arrive at maturity.

And again, how admirably hath the Creator contrived the young; seeing that the parent animal is not able to bear them about, or to clothe them, that they can soon move, and with the little help their dams can give them, shift for and help themselves: how naturally do they hunt for them, till they can pick and take in their proper food.

*Son.* And have parents in the human race no instincts to attach them to their offspring?

*Father.* They have reason, joined with and encouraging the developement of natural affection; and these induce them to nurse, feed, and clothe their young—hence, of all animals man is born helpless, and cast more than any other creature, upon their parents' care.

*Son.* This is indeed a manifest act of divine Providence!

*Father.* One more instance deserves to be mentioned. The winter is, as you may suppose, an inconvenient season to afford either food or exercise to insects, or many other animals. When the flowery fields are divested of their gaiety; when the fertile plants and trees are stripped of their fruits; and the air, instead of being warmed by the beams of the sun, is chilled with frost; what would become of such animals as are impatient of cold?—what food could be found by such as are subsisted only by summer fruits?—To obviate this evil, to save them from destruction, and at the same time to preserve the race from extirpation, the infinitely wise Preserver of the world provided, that such as are impatient of cold should have such a special structure, as, during that period, not to suffer any waste of their body, and, consequently, not to need any nourishment to recruit it—they live on in a sleep, in places of safe retreat, which instinct leads them to choose, until the warm sun revives both them and their food together.

*Son.* Another instinct, which you have not mentioned, is that which induces some kinds of insects to lay up provision for the winter supply. But this you need not dwell upon, for who does not know the foresight and industry of the little busy bee, who sedulously improves

——————— each shining hour,
And gathers honey all the day,
From every opening flower.

*Father.* This brings to my recollection, however, another wonderful proof of instinct; I mean that which excites and impels some of the feathered tribes to quit those parts of the earth which do not afford them sufficient food, or would obstruct their generation, and to betake themselves to such distant regions as afford all that is wanting for food or incubation.

*Son.* I remember that verse in the Bible—"The Stork in the heavens knoweth her appointed times, and the swallow and the crane observe the time of their coming:"—but how is it that those irrational animals should know

what way to steer their course, and whither to go?

*Father.* What but the great Creator's instinct should ever move a poor foolish bird to venture over vast tracts of land, and especially over large seas? What else should lead some to prefer Egypt to Britain, the Canaries to Spain, or Lapland to Scotland?

*Son.* I cannot think of it without being filled with reverence and admiration!

## DIALOGUE XXIV.

### OF INSECTS.

*Son.* I DON'T observe that winged insects have the head so sharp as birds, which I recollect you told me had the beak or bill pointed, in order to cut their way through the air.

*Father.* The reason of this is, first, that insects have no necessity for such long flights; and, secondly, because the strength and activity of their wings much surpass the resistance which their bodies meet with from the air.—If we examine, however, the rest of their body, we shall find that all is fitted for their several wants, nicely poised for flight, &c.

*Son.* Insects have no bones, I believe?

*Father.* They have no bones, nor are they covered with flesh and skin, as other animals, but with a curious mail, of a middle nature,

which serves both as skin and bone, for the shape as well as strength and guard of the body—shewing us, that the great Creator is not confined to one way.

*Son.* How minute, and yet how perfect, must be the limbs of insects!

*Father.* And how variously formed—how wonderfully adapted to their different purposes! You must have observed the admirable mechanism of those that creep—some of them having not only sharp hooked nails, but also skinny palms, to enable them to stick on glass; something in the same way that boys carry heavy stones, with only a wet piece of leather clapped on the top of the stone.

*Son.* How very strong, too, the limbs of grasshoppers?

*Father.* Yes; you must perceive that, when you hold one of them in your hand: indeed I have read that, bulk for bulk, they are many times stronger than a man. Then what strong and well-made feet and talons in those that dig, such as wild bees and beetles: but I must mention the structure of the legs and feet of

the mole cricket, as the best example: the fore legs are very brawny and strong, with feet armed each with four flat, strong claws, and a small lamina with two larger claws, and a third with two little claws: this lamina is jointed to the bottom of the foot, to be extended to make the foot wider, or withdrawn within the foot. These feet are placed to scratch somewhat sideways, as well as downward.

*Son.* This shews the great Creator's wisdom.

*Father.* But if we admire the formation of those that creep, how must we wonder at the structure of such as fly? Look at the wings, distended and strengthened by the finest fibres, like bones, and these covered with the finest and lightest membranes; some of them adorned with the most beautiful feathers, and provided with the finest joints and foldings, so that the wings can be withdrawn, and neatly laid up in their cases, when not wanted, or else readily extended for flight.

## DIALOGUE XXV.

### OF INSECTS.

*Son.* It seems to me as if the wonders of creation were more perceptible in the insect than in the elephant.

*Father.* Yes; and when you consider, that even the smallest animalcules are furnished with all the joints, muscles, tendons, and nerves, necessary to that brisk and swift motion which many of them have, you must still more reverence the power and wisdom of their infinite Contriver.

*Son.* I do indeed feel all that you say.

*Father.* And then remember, that there is shut up in that little compass, a whole and complete body, as exquisitely formed, and as neatly adorned, as that of the largest animal. Let us consider, that they have eyes, a brain, a mouth, a stomach, entrails, and every other part of an animal body, as well as legs and feet; and that all these parts have each of them their necessary apparatus of nerves and muscles; and that all are covered and guarded with a well-made

cover or ligament, beset with bristles, and adorned with neat scales—all lying in a body many times less than a grain of sand, so that the least drop of water can contain many of them, and afford them also sufficient room to dance and frisk about in.

*Son.* I thank you for the trouble you take with me, in giving me these instructions, which so much enlarge my ideas of the wisdom, power, and goodness of the Creator.

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## DIALOGUE XXVI.

### OF PLANTS, AND THEIR PROPERTIES.

*Father.* OUR indulgent Creator, who formed this earth for us to live upon, formed it also to produce what is necessary for our support and pleasure—such as plants, trees, and flowers, in very great variety. From the beginning of the world these have continued in regular succession, without any new creation in any one production of the earth, unto the present day—neither in living creatures is there any new creation. And what merits your particular notice is, that so many thousands of plants,

growing in the same soil, and enjoying the same sun, and the same rain, should differ so much in taste and smell from each other.

*Son.* From what are plants produced?

*Father.* From seeds produced by the plants, each producing its kind, which lie neatly enclosed in husks, for their preservation: and of these there are above twenty thousand different kinds. Seeds shoot their root downward, and the stalk or trunk upward.

*Son.* And how do they grow?

*Father.* By the air, rain, warmth, and that nourishment which they imbibe with the moisture of the ground, through the small fibres of their roots.

*Son.* Of what use is the bark and the leaves of trees?

*Father.* The bark, to preserve them from external violence, and to nourish them by the rising of the sap—the leaves to catch and receive the dew and rain.

*Son.* I have often remarked, how curiously the leaves and flowers of plants are folded up before they blow and expand.

*Father.* Perhaps your attention has never

been turned to the various ingenious ways in which their parts lie together:—there is the close couch, as in roses; the concave couch, as in verbascum (mullein); the single plait, as in pease blossom; the double plait, as in blue bottles; the couch and plait together, as in marigolds; the roll, as in lady's bower; the spire, as in mallows; and lastly, the plait and spire together, as in convolvulus.

*Son.* Is there as much care observable in the preservation of the seed and fruit as in that of the flower?

*Father.* Yes; in every part the traces of divine Wisdom are clearly seen—some, you know, which dare to show their heads all the year round; and of these the flower seed or fruit is locked up all the winter, together with their leaves and branches, in their germs, and well fenced and covered there with neat and close tunics—and for such as dare not so expose themselves, with what safety are they preserved under the earth, in their root, seed, or fruit, to be invited out by the kindly warmth of the spring. And when the whole vegetable race is thus called out, it is interesting to ob-

serve the methods of preserving them from harm, by making some of them lie down prostrate, and others close themselves up upon the touch of animals, and the most to shut up their flowers or their down, upon the close or cool of the evening, or on the approach of rain,or other matters, which might be prejudicial to the tender seed.

*Son.* I think you told me once, that there are not two leaves alike, even on one tree.

*Father.* True; two things exactly alike are not to be found in the whole world: so various are the works of God. The uppermost surface of most leaves is smooth or varnished, that the water may not lodge upon them, which would soon make them decay. The undermost is without that varnish, that it may imbibe the dew.

*Son.* Of what use are those trees which bear no fruit?

*Father.* Our forests not only afford us a beautiful and variegated prospect, and an agreeable shade, but also timber for building, masts for our ships, materials for husbandry, for furniture, for the various exercises of art, and for

fuel. Of these, the oak, the ash, the fir, the sycamore, the beech, the alder, the walnut, the elm, the willow, the box, the mahogany, and the cedar, are the most valuable.

*Son.* I was not before so sensible of the value of trees in general; those which I valued most were fruit trees.

*Father.* And even of these, how plentifully has our heavenly Father provided—and in what pleasing variety! Trees, which bear apples, cherries, pears, plums, gooseberries, currants, raspberries, apricots, peaches, grapes, pine-apples, oranges, lemons, nuts, mulberries, quinces, &c. What an indulgent Parent! who hath not only made such rich provision for our necessities and bare support, but even for our enjoyment and pleasure:—to please our palate, to refresh, to cool, and allay our thirst, during the parching heat of summer. Neither must we here forget the variety of garden plants and herbs, for our table: the spinage, the cabbage, the sprouts, the cauliflower, the lettuce, the artichoke, and the asparagus—and the useful roots, the radish, the onion, the turnip, the carrot, the potatoe, and many others.

*Son.* Are there not some plants useful in medicine?

*Father.* Yes; the Almighty has not only given us some which are good for food, and others which are pleasant to the eye, but those also which heal our sicknesses, and alleviate and ease the pains of our poor infirm bodies.

But, besides these, there are other plants still which are designed for the peculiar service and good of particular places, either to cure such distempers as are peculiar to them, or to supply some constant necessity not easy to be supplied in any other way. In hot countries, where water is scarce, there are plants which contain not only moisture enough to supply their own vegetation and wants, but to afford drink to man and other animals. The wild pine has leaves that will hold a pint and a half of rain water. "When we find these pines," says Dampier, "we stick our knives into the leaves, just above the root, and that lets out the water, which we catch in our hats, as I have done many times, to my great relief." Added to which, the water-with of Jamaica is an interesting example:—it grows on dry hills, in

the woods, where no water is to be met with, and its trunk, if cut into pieces two or three yards long, and held by either end to the mouth, affords a clear and refreshing drink to the thirsty traveller.

*Son.* I hope I shall always love and reverence so kind and so gracious a benefactor—and prove my gratitude sincere, by my unceasing attention to conform to his divine will in every thing.

*Father.* This, I do assure you, would rejoice my heart. God grant that this may be the happy fruit of these instructions, not only to you, but to all who contemplate the wonderful works of God.

*Son.* How is fruit produced?

*Father.* In many plants, the fruit proceeds from the same part where you see the blossom has been: but in the small nut, and the chesnut trees; in the Turkish and Indian corn; the fruit comes where the blossom has never been—otherwise, almost all fruits are preceded by blossoms: but the fig tree comes to perfection without a flower.

*Son.* How is the fruit preserved?

*Father.* By the shell or rind; but it is not the same in all. In melons and cucumbers this is very thick, in others very thin. Those lying near the ground would otherwise be destroyed by insects—and grapes could not be easily pressed, if their skin or rind was like that of the melon. The peach and the plum are appointed for our refreshment, at the close of the violent heats—their use being limited to a short period, their clothing is adjusted accordingly, and a thin skin is sufficient. The apple and the pear, which are designed to be continued through the winter, have a covering of a more compact contexture. For which reason, chesnuts, and other species of nuts, are preserved in a still more secure manner. The chesnut, in its infant state, is secured from the birds, as is the gooseberry, by prickles. And the walnut, which, in its immature state, furnishes our tables with such a fine pickle, would probably be destroyed in its infancy, if it were not secured by the bitterness of its rind.

*Son.* And where are to be found the seeds of these fruits?

*Father.* As they are very precious for the

propagating of their respective species, they are placed within the fruit, in a safe repository: some in a hard stone, others with glazed walls. One of the most curious which I have seen, is the cassia.

*Son.* How can we best judge when fruit is ripe?

*Father.* By the colour, and by the fading of the stalk, or when with a gentle touch they are easily loosened from the branch.

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## DIALOGUE XXVII.

### OF FLOWERS.

*Father.* SUPPOSE we now walk into the flower garden.—See, what a beautiful sight! What variegated colours! How pleasing to the eye! How fragrant to the smell!

*Son.* May I ask you what are those properties of flowers, which I ought more particularly to notice?

*Father.* Flowers are distinguishable by their beautiful colours, their variety, and by their fragrant smell. Nor are they merely orna-

mental, but most of them very serviceable. It may justly fill you with admiration, that from green plants so many fragrant flowers should spring up—that from a bulb, of no very pleasing form, should arise such variegated tulips—or the beautiful ranunculus, from a dirty little claw—this, unless we had seen, we could never have believed.

*Son.* Of what sort are their colours?

*Father.* Of all sorts—sky blue, sea green, common green, olive green, purple, yellow, orange, crimson, red, violet, rose colour, mouse colour, ash grey, silver colour, &c.

*Son.* What have you to observe concerning their smell?

*Father.* This consists in the fragrance arising from the juices, and from volatile parts, which are continually exhaling out of the small evaporating tubes of the flowers, or from the leaves.

*Son.* Which excel most in fragrance?

*Father.* Violets, July-flowers, woodbines, roses, lilies, auriculas, &c. the very mention of which reminds us of their fragrance. Some wild heath flowers, and field flowers, have also a peculiar flavor.

*Son.* You have said that they are not only ornamental, but useful?

*Father.* Yes; flowers cheer the drooping, and refresh the wearied spirits: they yield us fruits and seed—and particularly honey, oil, and wax—snuff, perfume, paint, and medicines.

*Son.* But some flowers have a disagreeable smell.

*Father.* They may thereby possibly correct or absorb the noxious vapours. They may serve for food to some animals and insects, or they may have some medicinal virtues. With all our boasted knowledge, we have not yet discovered all the excellent uses either of herbs or flowers.

*Son.* What a kind and indulgent Providence!

*Father.* And what a strong argument to trust in divine Providence has our blessed Saviour drawn, from even that part of nature we are now contemplating!

"And why take ye thought for raiment? consider the lilies of the field how they grow: they toil not, neither do they spin; and yet I say unto you, that Solomon, in all his glory, was not arrayed like one of these. Where-

fore, if God so clothe the grass of the field, which to-day is, and to-morrow is cast into the oven, shall he not much more clothe you, O ye of little faith?"

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## DIALOGUE XXVIII.

### OF SEEDS.

*Son.* By what means are plants and flowers preserved and increased?

*Father.* Each plant produces a great quantity of seed, which preserves it to future generations. Some seeds are so small as to be scarcely visible.

*Son.* Where are these seeds to be found?

*Father.* In some, in the top of the plant; in others, in the middle of it; and again, in some, between the leaves, or under them. They are found in little husks, or in convenient partitions, separated from each other by a thin skin.—Others stand in order together, as in the sunflower.—Does it not appear to you astonishing, that such great plants as trees should arise from such small seeds?

*Son.* It does indeed—and yet, if the seeds were larger, they might injure us by the fall. I remember very well the fable of the acorn and the philosopher.—But does one plant, or tree, produce many seeds in one season?

*Father.* This is very various—in some, more; in others, less. A tobacco plant has been known to produce more than forty thousand seeds: an elm tree, more than three hundred thousand annually.

*Son.* And why such an amazing number?

*Father.* Hereby is a great provision made for the fowls of the air. If they were once all consumed, which might easily be the case, how could we ever recover them again, if there were not such a great increase? Admire this display of Divine power, wisdom, and goodness: for without such a provision, the birds must half of them perish. Food, in that form, and small compass, can more easily be preserved for their winter food.

*Son.* How do the seeds come out of the pod?

*Father.* In dry weather, when the pods are withered, they open, and the seeds being dry, they easily fall out upon the ground; and those

seeds which are not gathered, sink into the earth with the rain.

*Son.* What becomes of the lighter seeds?

*Father.* They are carried about by the wind, and fall when the wind ceases. For this reason, we see plants upon high old walls and towers; because seeds, falling between the crevices of the stones, often grow. Birds, also, in carrying them, may frequently let them fall in their flight. And besides this, nature has furnished several of them with soft down, which serves instead of wings, to convey them through the air to distant places.

*Son.* I remember to have seen seed pods suddenly bursting with a loud noise, and throwing out their seeds with force to some distance.

*Father.* This is another way in which seeds are scattered abroad. The cover, or seed pod, so soon as it begins to dry, bursts open on one side, in an instant, and is violently turned inside out, and so smartly throws off the seed—in others, the seed case is of round figure, and girded about with a sturdy spring resembling a fine screw—so soon as the spring becomes strong enough, it suddenly breaks the case into

two halves, like two little cups, and so flings away the seed.

*Son.* Can you tell me how those plants which grow in the sea disperse their seeds?

*Father.* I cannot do it better than by mentioning the sea weed. You know that on many of this kind, solid risings or lumps are observed in some seasons, whereon are lodged several round seeds, as big as mustard seed, which, when ripe, the covering breaks, leaving the seed to float up and down with the waves. This seed coming near stones, or any solid foundation, sticks to them by means of a gummy substance which they carry with them, and shooting out, in time come to perfection and magnitude.

*Son.* How long will seeds continue fit for growing?

*Father.* Several years; for sometimes wet seasons come on, when seed cannot be gathered in, and then we must have recourse to the old stock.

*Son.* What makes the seeds sprout forth?

*Father.* Moisture and warmth, which cause a fermentation in the meal, or flour of the seed,

and give the first nourishment of life to the sprout therein enclosed. This no sooner makes its appearance, than it casts off its husk, sends forth a root, and, receiving more nutrition, it shoots up, and gradually rises to perfection?

*Son.* Do seeds answer any other purpose than those which you have already mentioned?

*Father.* Yes; some seeds are food for man, and for beasts, as well as for birds. They also yield us oil for painting, and provide us with what is of a medicinal nature. From which we learn, that the smallest things are not to be overlooked, or despised, being often found exceedingly beneficial.

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## DIALOGUE XXIX.

### OF THE SEASONS—OF GRASS, CORN, &c.

*Son.* WHAT opinion am I to form of the changing seasons?

*Father.* That they are ordained for wise purposes: to promote vegetation, and make men industrious.

*Son.* Should not we be better without the winter season?

*Father.* By no means: even the winter (the severity of which we feel so sensibly) lays the foundation for our future sustenance, by making the earth more productive; and frosty weather contributes to our health. The earth must have rest too as well as man. So that we ought to be thankful for the winter's cold, as well as the summer's heat. And beside this, when it is winter with us in the northern part of the globe, it is summer with the inhabitants of the southern hemisphere. And surely we are not so selfish as to wish to monopolize all the favors of heaven to ourselves.

*Son.* But spring!—I am delighted with the spring.

*Father.* Have you considered why the spring so much delights you?—It is partly owing to the winter you have so lately passed through: your having just then emerged out of that rigorous season, gives you a more lively perception of the happy change. As a severe fit of sickness gives additional enjoyment to restored health. The spring yields you singular pleasure as a time of promise. What appeared dead before, begins then to assume new life;

and presents you with the pleasing hope of the succeeding fruitful seasons: the prospect of the summer, which, in process of time, raises every thing to its full maturity: and the prospect of the harvest, which not only rewards the toil of the husbandman, and furnisheth us with provision for the time present, but also sets before us our winter store, that fear of future want may not distress us.

*Son.* Which are the most useful products of the earth?

*Father.* Grass and corn. God causeth grass to grow for the cattle—and bread, to strengthen man's heart.

*Son.* What is there particularly observable in the grass?

*Father.* That it grows spontaneously without the help of man, affords sufficient food for the beasts of the field, and covers the upper surface of the earth as with a carpet, very pleasing to the eye.

*Son.* But what provision is there for the cattle in the winter?

*Father.* Part of the grass is mown and dried, which is then, you know, called hay, and

serves for their winter food. The grass is, in some seasons, cut a second time: or it remains in the field, for the cattle's subsistence after harvest, in which state it is in some places called soil.

*Son.* Which are our principal grains?

*Father.* Wheat, rye, barley, oats, beans, peas, &c.

*Son.* Of what use are the long stalks?

*Father.* That the ears may not easily be beaten down upon the moist ground. They furnish the husbandman also with straw, for various purposes.

*Son.* For what purpose are the stalks so smooth?

*Father.* That the rain may easily run off, and not rot them.

*Son.* Why have the stalks knots and shoots, or blades?

*Father.* That they may not be broken in the open fields, by the violence of the winds.

*Son.* Why are they thus pointed and flexible, or waving?

*Father.* The birds would otherwise sit upon them at their ease, and pick out the grain.

*Son.* For what reason do they sow wheat and rye before the winter?

*Father.* That they may have time for growth. The blade appears time enough before the winter, to stand against the wind and weather; the valuable ear does not then expose itself to the violent season, but waits for warmer weather, and then rises to perfection.

*Son.* How do the young plants endure the bleak weather?

*Father.* They are richly surrounded with blades, like those of grass, in the spring of the year, which fall off in the warm weather, and then the plant feeds and flourishes.

*Son.* How is it with the grain?

*Father.* The kernels of the grain are securely lodged in strong husks, or chaff, that the sun (after the corn shoots out in the ear) should not scorch and shrivel it, or the rain or dew cause it to rot.

*Son.* And what farther?

*Father.* Also, that in time of harvest the grain may not be shaken out and lost, as the husbandman is bringing it into the granary.

*Son.* How do the ears of corn grow, and how do they ripen?

*Father.* When the dew and rain have made them swell, the enlivening sun dries them by degrees through the whole day. By these means they become fully ripe; especially when, after reaping, the sheaves stand some time in the field.

*Son.* And what is the produce?

*Father.* We have never such abundance as to render it of little value; or such a scarcity, that men and cattle perish for want of it. A demonstrative proof a divine Providence.

*Son.* But suppose there is a failure in the crop?

*Father.* When that happens in one place, other countries are generally able to supply the deficiency—which has lately been the case in France; a great scarcity prevailing there, whilst in other nations there was a very plentiful harvest.

*Son.* What is the fruitfulness or product of each stalk?

*Father.* The produce is almost incredible—I have been informed, that from one grain of wheat have risen one hundred stalks, bearing ears, which yielded in the whole two thousand grains.

*Son.* Almost incredible indeed! but this, I suppose, does not often happen?

*Father.* Their different produce depends much on the nature of the soil, upon good husbandry, the nature of the seed, and the manner of sowing it.

*Son.* In what other respects do we see the wisdom and goodness of God with regard to grain?

*Father.* That it can be preserved in granaries, and continue good in some years of bad harvest. Many other fruits of the earth cannot be preserved one year—some not one month—and others not one day, after they are fully ripe. Neither is there any herb or plant of the field which affords us such a wholesome nourishing food. With bread we are never satiated. It is justly called the staff of life.—And yet how insensible are we of its value—how little thankful for bread! O, may we never incense the Almighty, by our ingratitude, to teach us the worth of it, by withholding from us the fruits of harvest.

*Son.* Of what use is barley?

*Father.* Of it malt is made, from which

we brew ale, beer, and also porter—nourishing, strengthening liquors, especially for the labouring part of mankind.

*Son.* What use is made of oats?

*Father.* In some countries, particularly in the northern parts of Great Britain, the common people make a wholesome bread of this grain. But it is generally given to cattle, particularly to horses, without being ground into meal.

*Son.* Which are the most useful plants of those which are not designed for food?

*Father.* Flax and hemp. The former, which the Dutch in particular cultivate with great care, is very profitable to the farmer, and very useful to the world at large.

*Son.* In what respect?

*Father.* The seed yields oil, and the finest of our linen is made from the rind of the stalk. And when that fine linen is much worn, do you think that it is of any farther service?

*Son.* I have heard that fine rags are a very acceptable present for hospitals.

*Father.* So they are—but would you think that we make our finest writing paper of such rags?

*Son.* Make paper of rags! How is that done?

*Father.* When ground small, they make of it a pulp, or paste, with water and size, and pour it into flat moulds, from which we receive one of the most useful articles of business. The coarser paper is made of coarser rags.

*Son.* That is a curious manufacture indeed, which I should wish to see.

*Father.* In our next walk, we will step into the paper-mill, and show you the whole process.

*Son.* And what use is made of hemp?

*Father.* Of this they make the coarsest kinds of cloth for sails, sacks, &c.—and also, ropes and cables for ships.

*Son.* The farther you proceed, the more I am amazed at the very ample store of good things which God hath provided to supply the manifold wants and necessities of mankind.

*Father.* The whole world is a storehouse, or grand magazine, furnished with every article that we have occasion for.

"O Lord, how manifold are thy works! The whole earth is full of thy riches."

## CONCLUDING DIALOGUE.

### OF THE PRODUCE OF OTHER COUNTRIES, AND THEIR USE IN MERCHANDISE.

*Son.* WHAT advantage have we from the produce of the other parts of the world?

*Father.* As every land has its own particular produce, by means of navigation one country partakes of the produce of another—and thousands gain their livelihood by ploughing the ocean, as the farmers do by ploughing the earth. I will mention to you here, some of the principal articles of merchandise, the productions of the four quarters of the world, as it may probably be of service to you in future life. And if you be not a merchant, it is still proper that you should know them.

*Son.* You will oblige me.

*Father.* From South America we receive gold, silver, quicksilver, Peruvian bark, and balsam of Peru—from Surinam, cocoa, cotton, and coffee.—From North America, tobacco, pipe staves, skins, furs, tar, pitch, and resin—From the West Indies, rice, sugar, coffee, cotton, and indigo—From the East Indies, cinnamon, cloves, nutmegs, and peppe tea, china,

japan-ware, and silks—From Africa, gold-dust, ivory, olives, palm wine, saltpetre, leather, gums, and drugs—From the Levant, cotton, raw silk, rhubarb, and oil—From Spain, Portugal, and France, our best wines; oranges, lemons, figs, prunes, raisins, and chesnuts: fine wool is also exported from Spain, and the steel of Biscay and of New Castile is judged to be the best in Europe—The Madeira and Canary Islands are also well known for their excellent wines, which the hottest weather, so far from impairing, greatly mellows and improves—From Norway, Sweden, and Denmark, masts, oak planks, fir timber, stock fish, copper, iron, furs, skins, pitch, and tar—From Germany, rhenish wine, hock, forest timber, and the juniper berry, (used in making geneva, the best of which comes from Holland)—From Russia, hemp, flax, turpentine, pitch, tar, furs, hides, and tallow—From Holland, flax, hemp, and madder.

*Son.* How thankful ought we to be, that so many millions of inhabitants are provided for, and in such abundance too, as to banish the distressing apprehension of want.

*Father.* Your reflection pleases me, as it shows you have not been inattentive to my instructions. You also perceive the great benefits of commerce, by which we obtain the productions of the most remote parts of the globe. The natives of one country not only labour for themselves, but for other countries—and others again for them. By these united efforts, accompanied with Divine co-operation, the whole world is supported.

I have now, my dear son, drawn your attention to the principal parts of nature, so far as your young mind is capable of comprehending them. I hope this slight sketch will excite you, with your rising years, to pursue these inquiries, to enlarge your knowledge of the glorious works of nature, and thereby engage you to love the God of nature—to serve him, and to magnify his name.

" Praise the Lord, all ye nations—praise him, all ye people."

FINIS.